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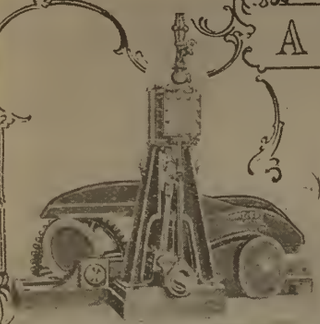
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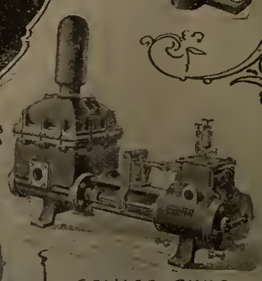
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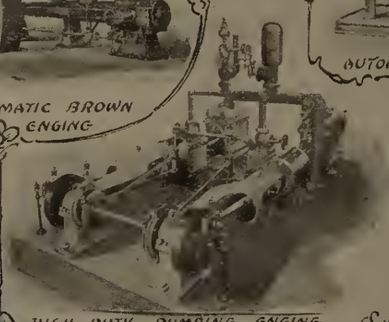
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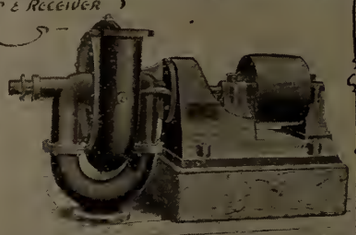
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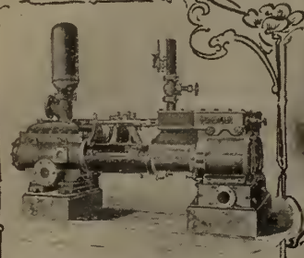
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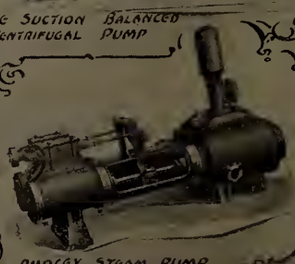
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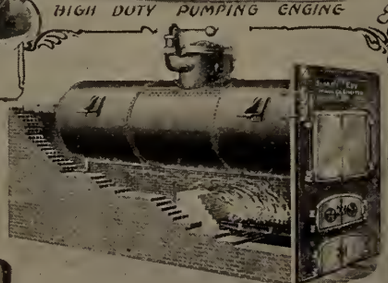
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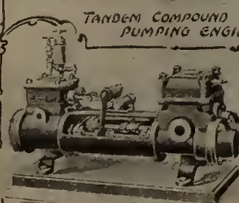
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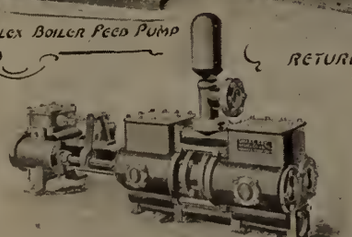
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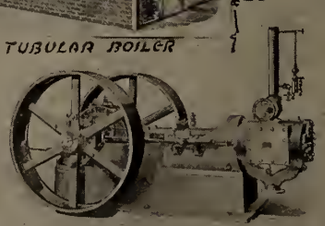
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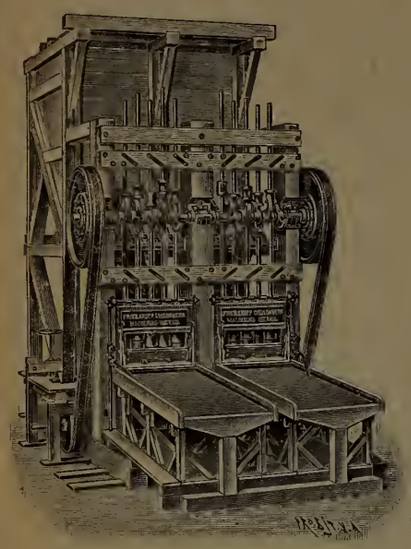

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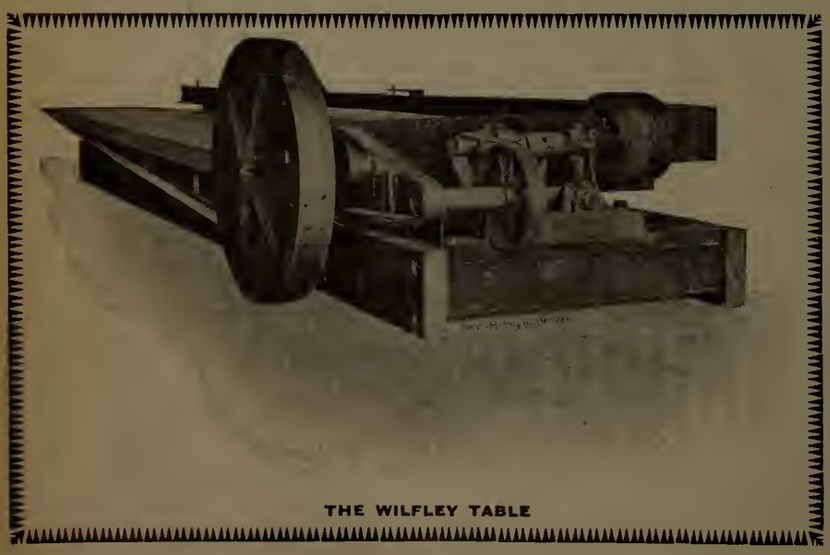

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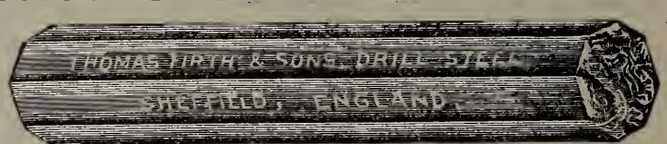

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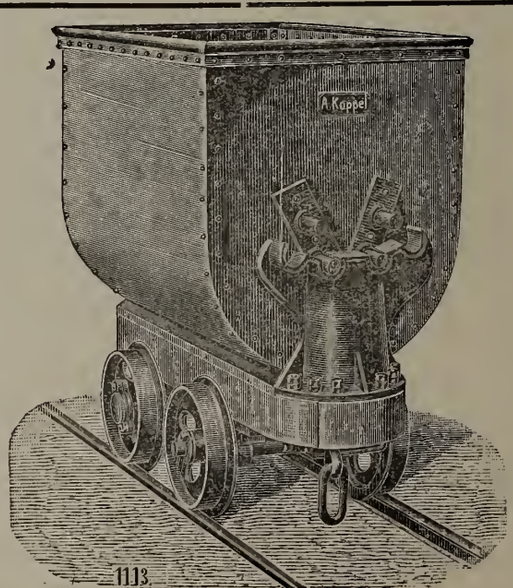

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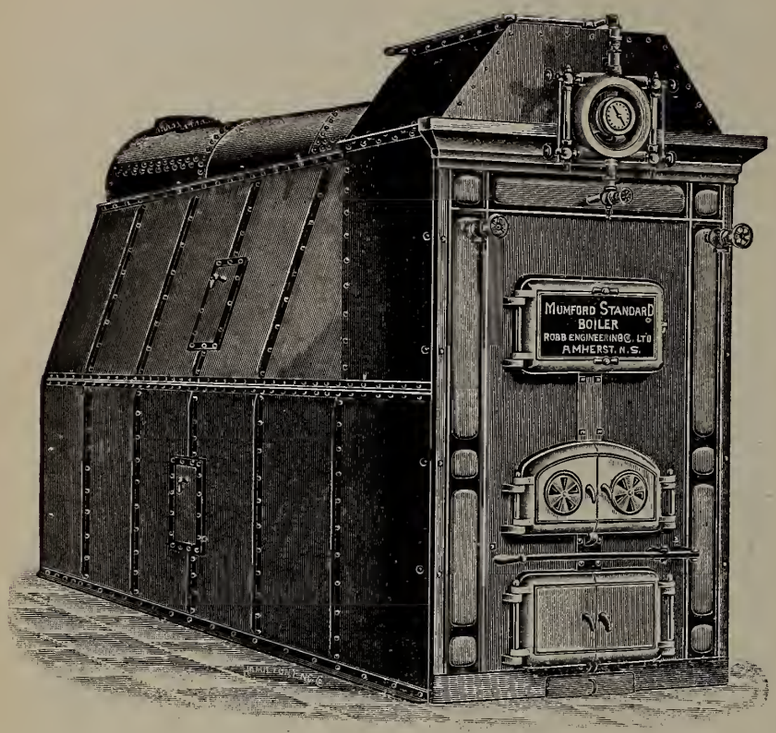

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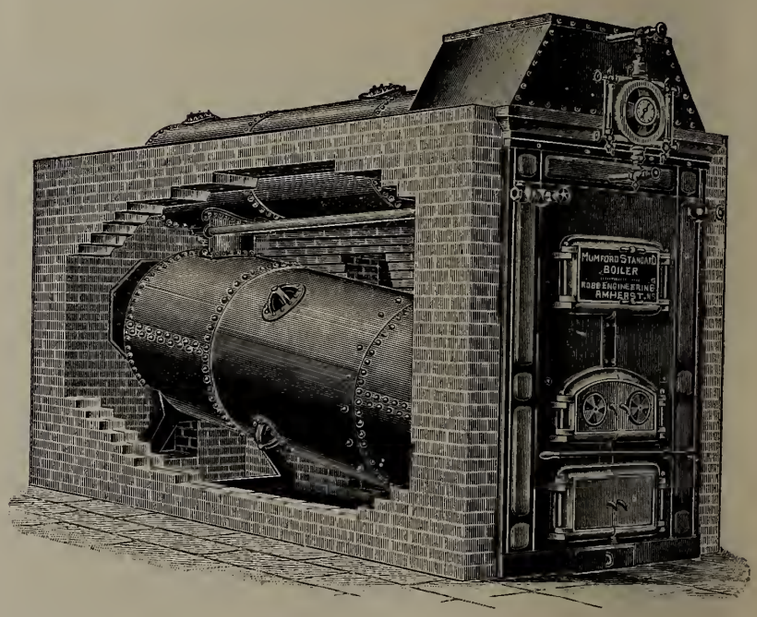

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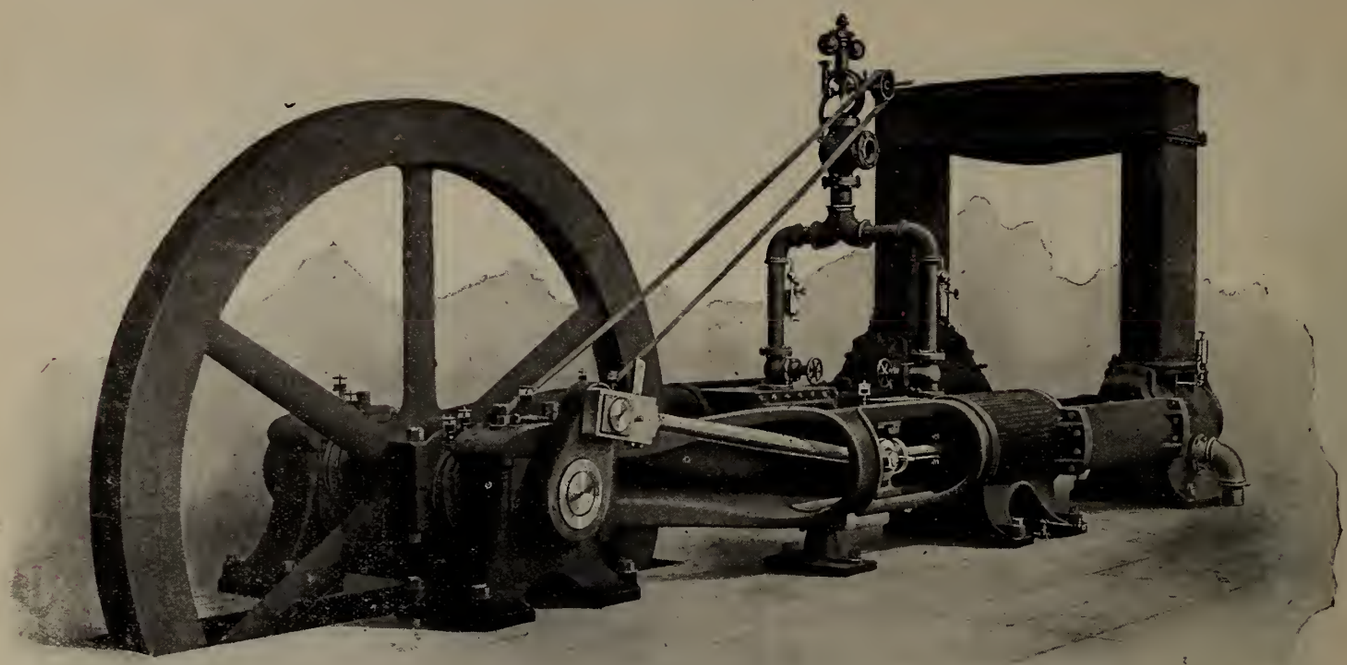

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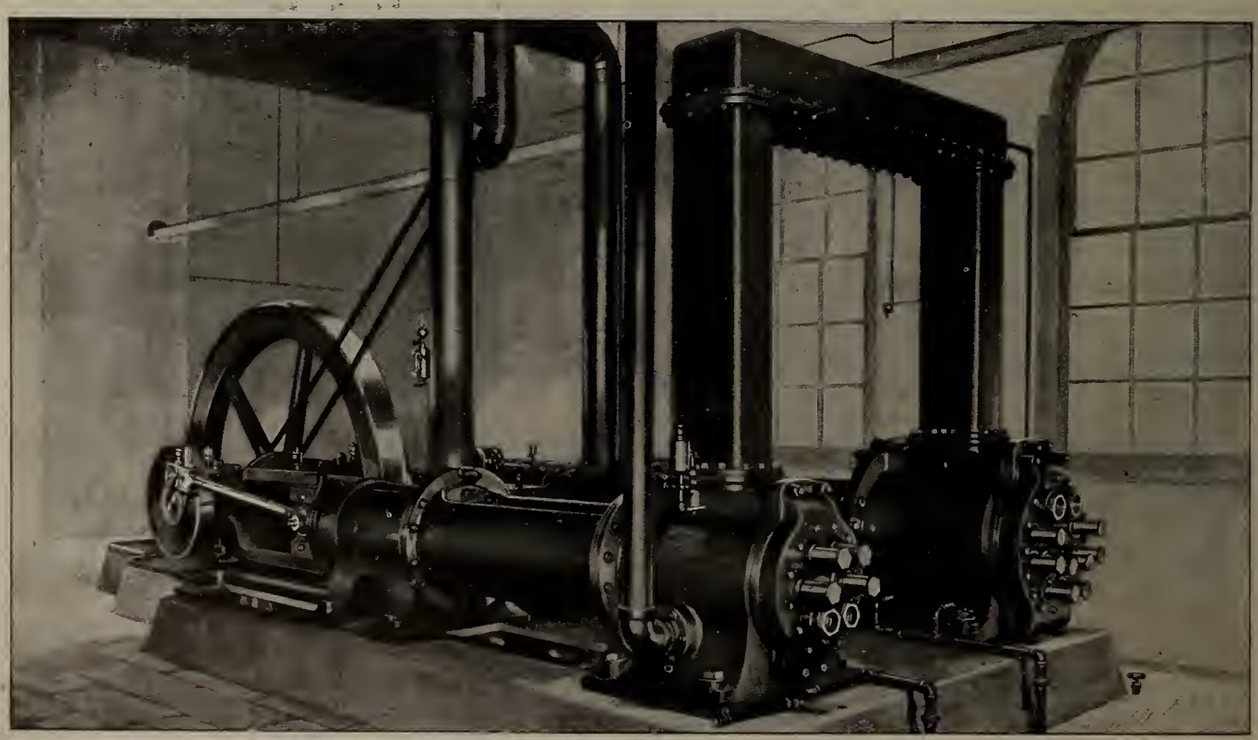

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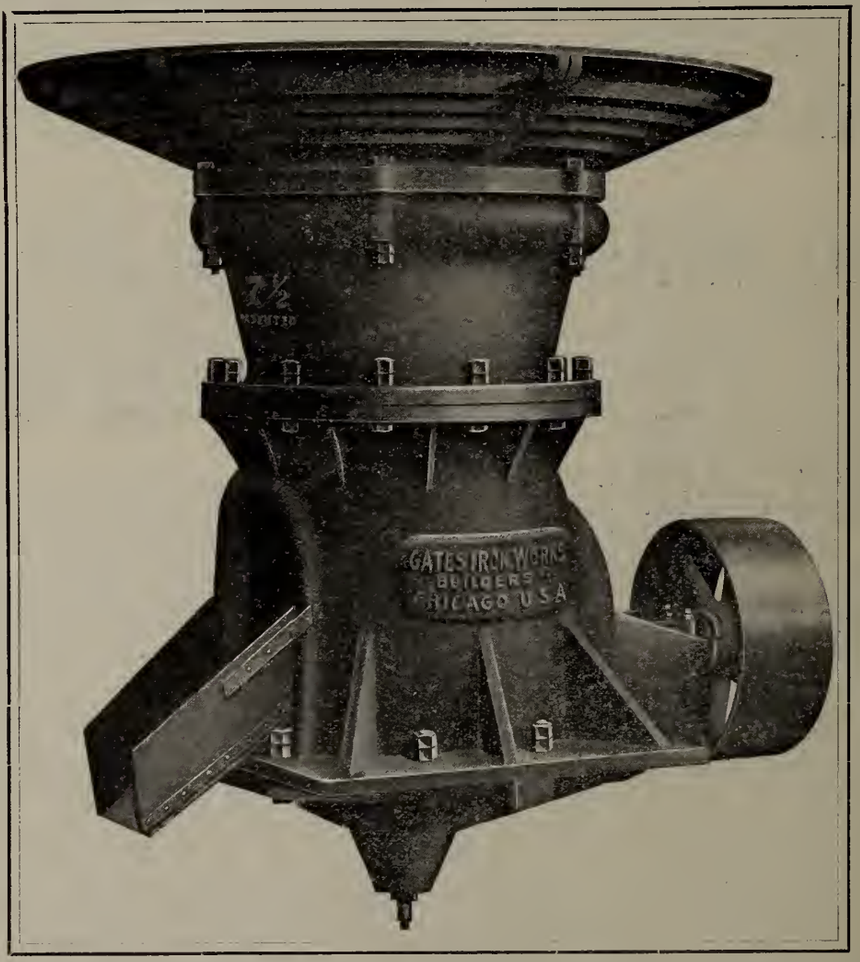

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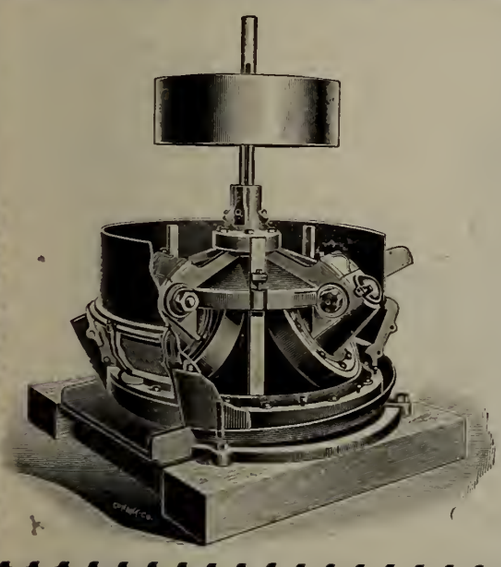

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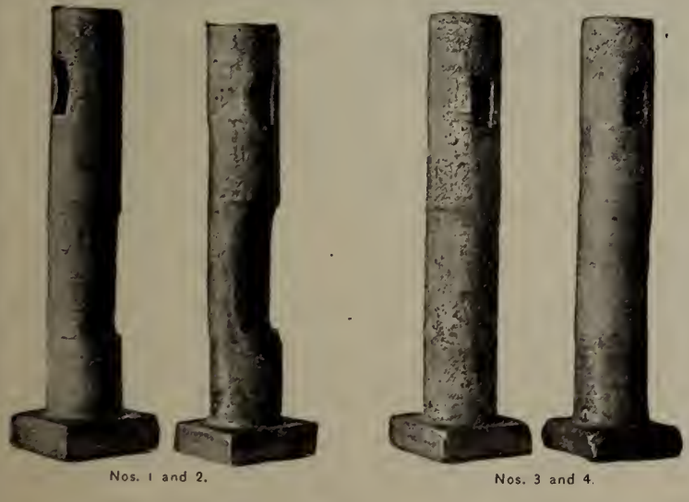

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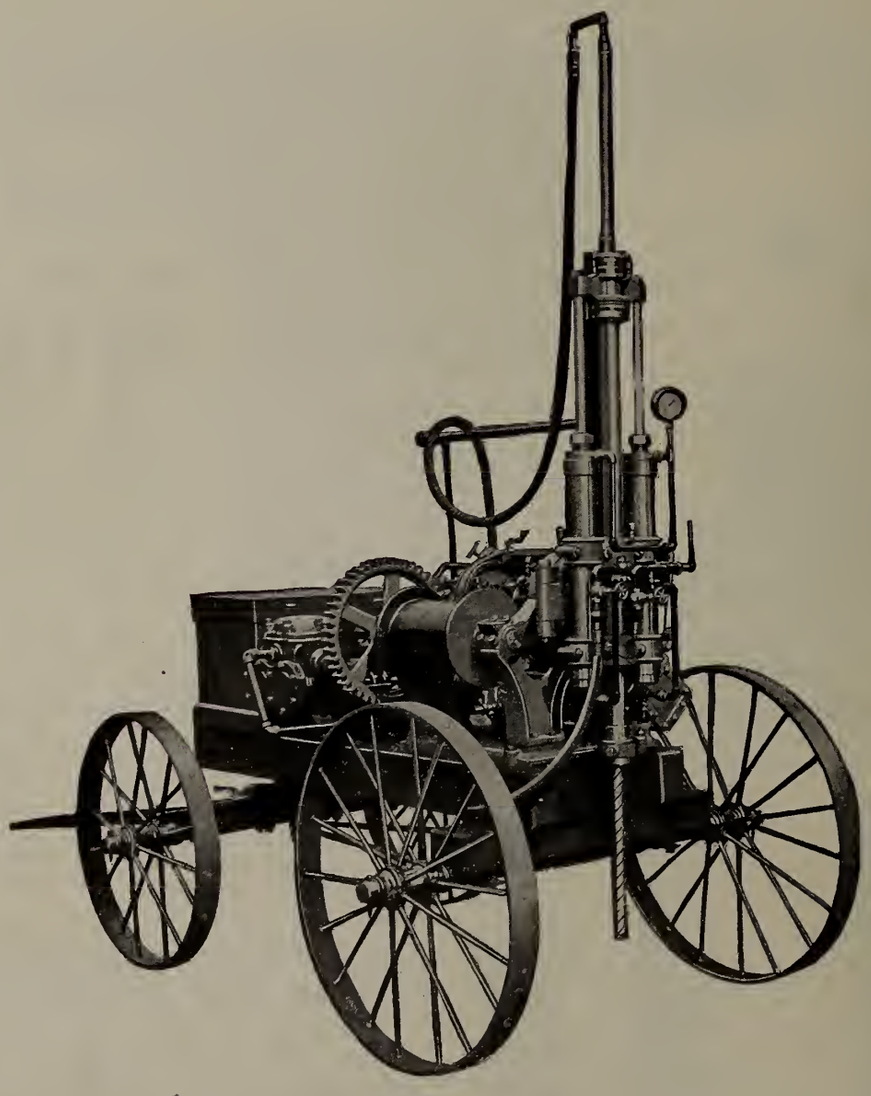

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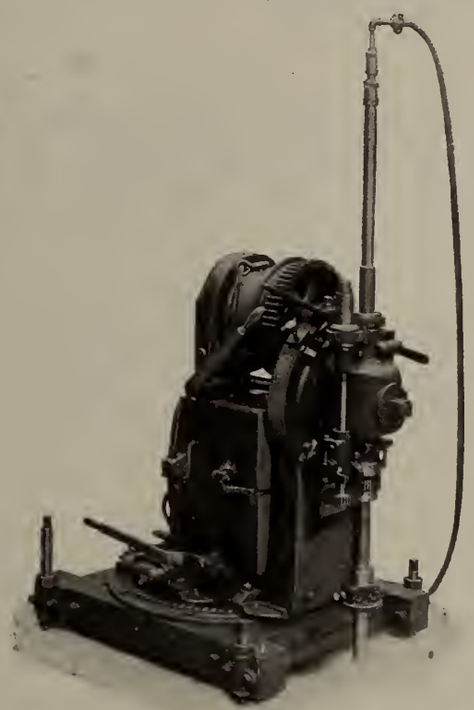

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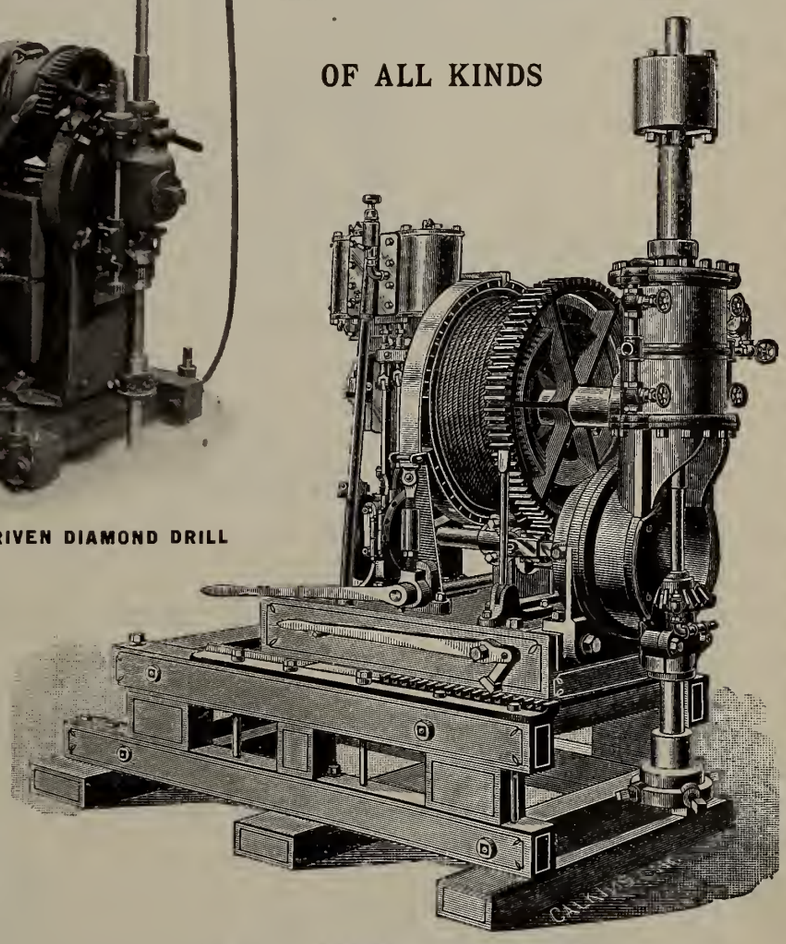

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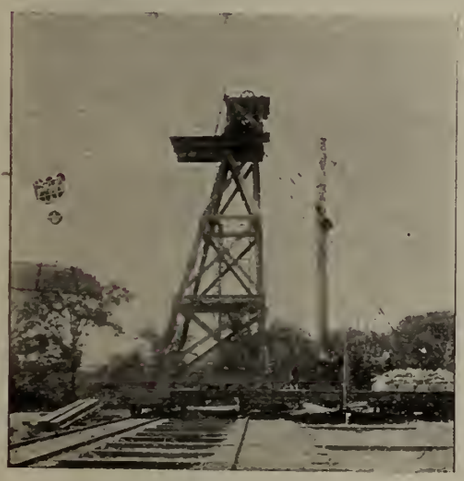

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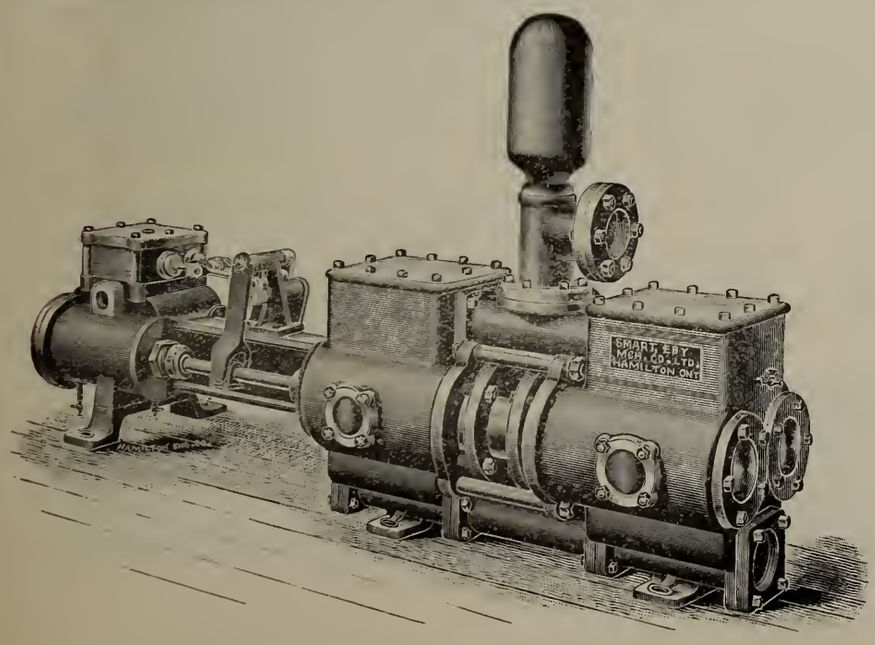

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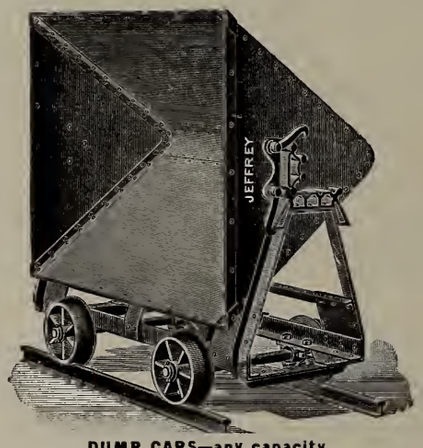

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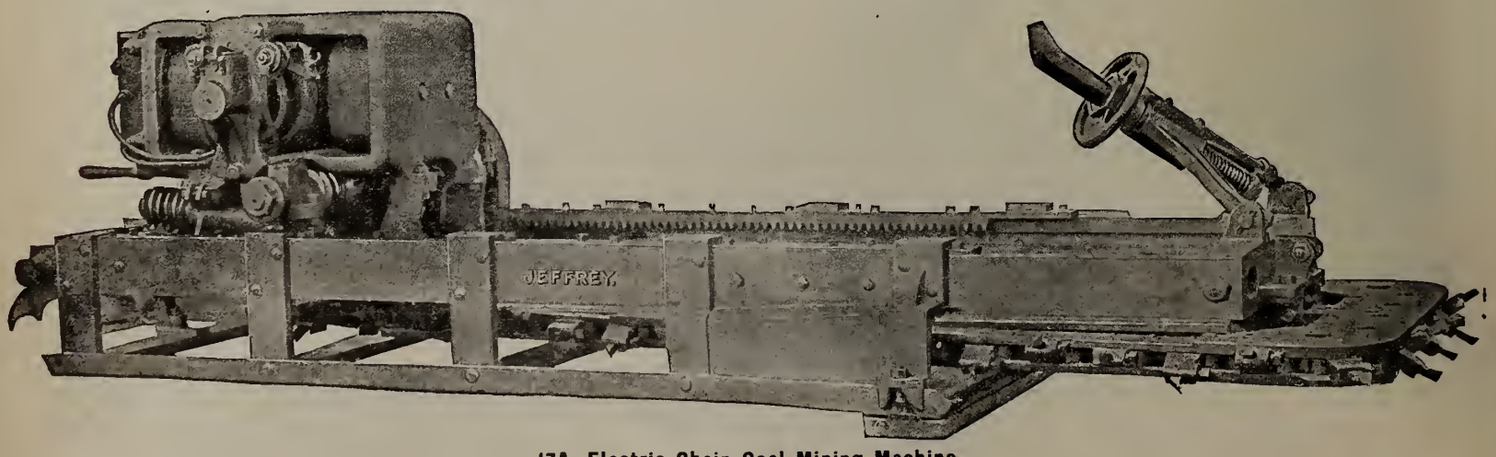

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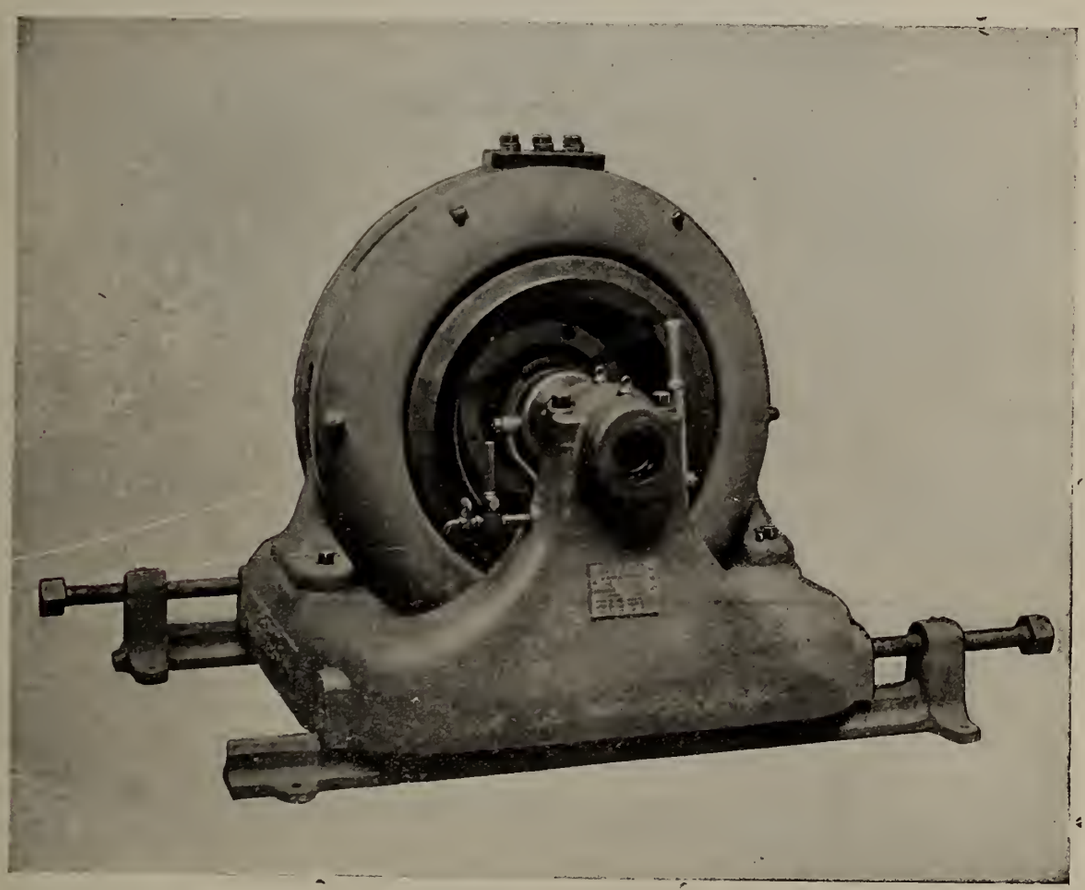

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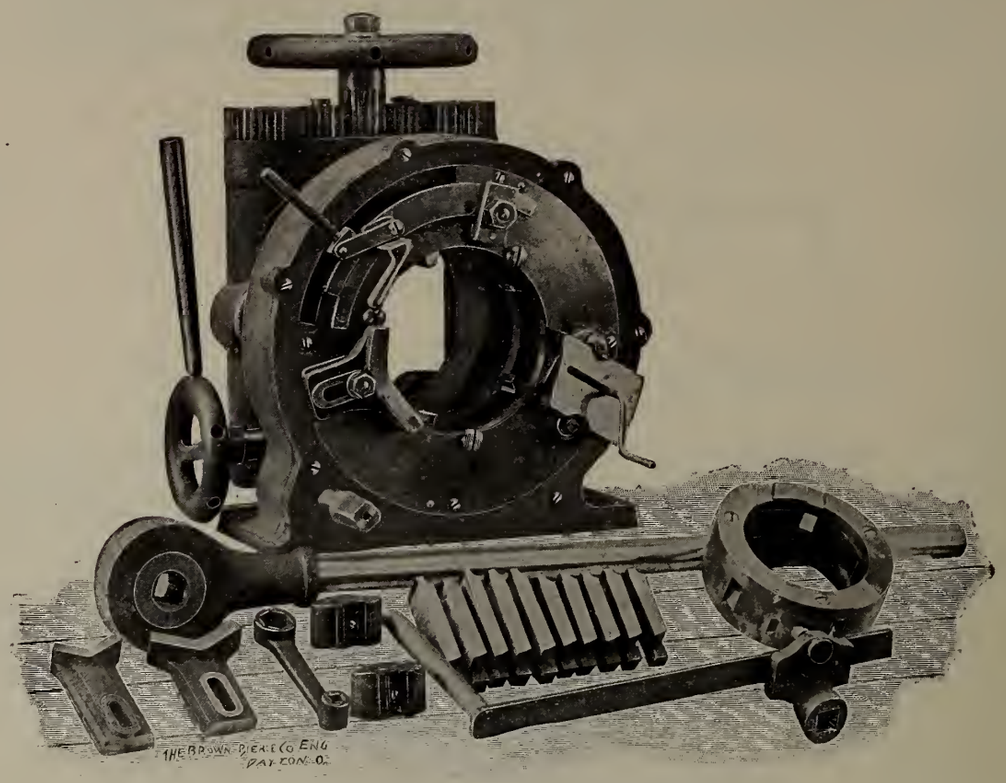

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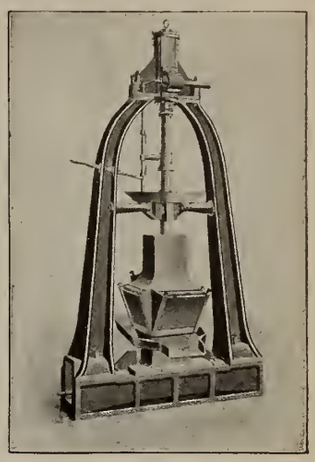

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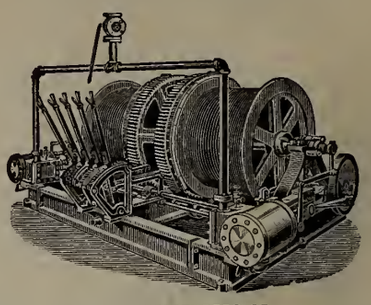

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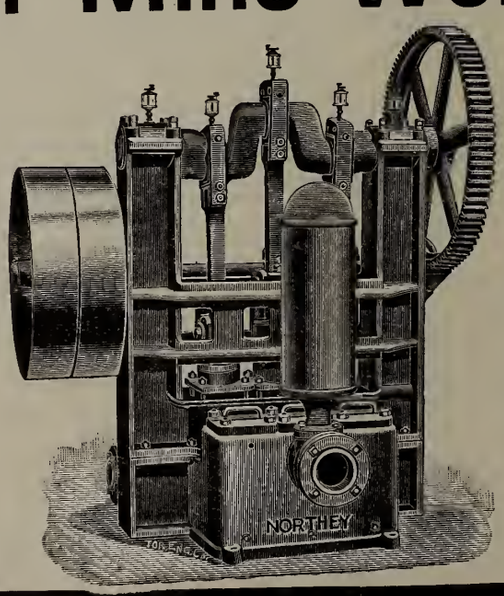

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The Canadian Mining Review

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 1. JANUARY, 1901. VOL. XX., No. 1.

Some Features of Canadian Mining in 1900.

The past year has witnessed the general collapse in Canada of "paper mining"; the mining stock boom has disappeared and, we hope, finally, so far as it was dependent upon the exertions of *men* and not upon the records of *mines*. The reaction began in British Columbia in the year 1899, and our western friends, with their usual foresight, attempted to get under cover early in the past year when the notable collapse of the "War Eagle" stock occurred Some reorganization has been effected in British Columbia properties and they are now on the straight road to recovery, provided they were originally founded on merit; but where their claim to recognition was shadowy in the first place it is probable that they will never be heard of again. The declines in the high-priced Boundary Creek ventures, such as "Knob-Hill,' "Old Ironsides," and some others of that section, was predicted and anticipated by those conversant with the difficulties attendant upon getting $6 out of $5 ore. The similarity between the sudden rise and long inflation of these stocks and the features attending the "War Eagle" stock, led many people to predict a similarly sudden collapse. After the present depression has culminated, and the atmosphere is once more cleared, we are of the opinion that values in British Columbia will be closer to actual worth than ever before, and that the industry as a whole will be in a far healthier condition. The public may then look for some real mining to be done and for values based upon the intrinsic merits of the properties concerned. One of the brightest features in the whole of the British Columbia market has been the successful year of the Cariboo Consolidated Hydraulic Co. and the rise of this stock in consequence; readers of the REVIEW may remember that this is one of the enterprises which we have been able to commend almost unreservedly, and we are not afraid to predict that the company will be one of the brightest stars in the firmament of British Columbia.

Coming easterly to the Province of Ontario the status of the nickel and allied copper mines is most satisfactory; the establishment of a refining plant by the Orford Company, the introduction of large capital by the Mond Company and the erection of their large works, the reopening of the old Bruce mines under modern management and with modern machinery, and the very extensive, in fact one may say huge, operations of the Clergue Syndicate, all point to a most satisfactory ultimate condition of the metal mining industry in Ontario. The gold industry of Eastern Ontario in Hastings County is also reported as very satisfactory, and (what is of more importance) as decidedly profitable, but when one comes to consider the Western Ontario gold fields one does not feel so optimistic; in fact the year 1900 has seen a condition of affairs in the Lake of the Woods district which is something worse than can be seen anywhere else in the Dominion.

The past year noted the gradual death of the second boom in this section. Although the Government have made no public announcement of the production of gold for the past year it is estimated, by those who have had access to the figures and are competent to judge, that the yield will not be much in excess of $300,000, whereas the production for 1899 was 424,000. During the last six months of the year mining can be said to have been dead in the gold fields of Western Ontario; all the work in the Rainy River section has ceased, and efforts to obtain new capital for some of the most promising properties in that section are not favorably entertained; in the northern section, although small returns were obtained from custom lots milled, yet the only producing mines were the Sultana and the Mikado. Since the transfer of the Sultana mine to a London corporation about eighteen months ago this property has been travelling fast upon a down-hill road. The Mikado, which from reliable and credible reports appears to be a property of considerable merit, has been hampered almost from the start by incompetent handling. The production of this property has been sufficiently large to have justified the payment of considerable dividends, but the amount disbursed has been entirely incommensurate with the bullion produced and we think our subsequent remarks fully applicable to this property.

The question of why a boom twice repeated in this country has failed to make known some permanently remunerative properties, is as pertinent as ever. It can safely be stated that the failure is due neither to the lack of properties of real value and merit (as witness the Mikado) nor to the lack of capital for working such properties (as witness the money spent on the Hammond Reef, the Regina, the Sirdar and others). To completely give the reasons why capital invested in this district has been unremunerative and why, in consequence, the section is held in disrepute by capitalists, is to write a long chapter. Over capitalization, and the greediness of promoters in realizing personal profits by selling their personal shares instead of treasury stock, are self evident factors in the case; but the most potent factor perhaps is one that is not recognized nor often mentioned in that section, and this factor is the complete lack of experienced or competent management of the properties that have been opened. There is a condition, common at present to all parts of the Dominion, which has also helped to keep back this section, and that is the unsatisfactory class of labor employed, and the remedy for this last trouble is one, perhaps, which only time can cure, but time is not needed to remedy the lack of competent management. It is the common remark of many of the first-class mining men, from other sections of Canada and from the United States, who have gone into the Western Ontario fields to examine on behalf of their clients or to seek investment for their own capital, that the management employed

in the mines that were working was almost without exception inexperienced in the work it had to do and therefore incompetent for the handling of such enterprises; and it is a well known fact that in low-grade gold countries only the best of management can expect to recover satisfactory dividends. From the REVIEW's own knowledge of many of the Lake of the Woods properties it is able to say that the investors who have found money for the enterprises undertaken have been most confiding and simple when they were satisfied to entrust the expenditure of their money to merchants, lawyers, grain dealers, speculators, British military gentlemen, or South African amateurs. In every case the efforts of these gentry have resulted in failures which have been only too fully advertised. The incongruous and amusing assortment of mining and milling equipment which can be seen in an ordinary trip through the mines is of itself most convincing evidence of the inexperience or ignorance of the management on these properties, In one place one sees the two stamp steam mill exalted into prominence, in another place one sees an ordinary contractor's donkey winch installed as a hoisting engine; again a forty stamp mill is erected to supersede a ten stamp mill, and the management of such a large plant is practically in the hands of a stone mason. Several miles of broad gauge track can be seen leading to a small ten stamp mill, and we are sure we are within the mark when we state that less than one thousand tons of *ore* have been hauled over that road. The indiscriminate use of diamond drills, the money sunk in coffer dams for speculative prospecting purposes, the attempt to transport ore, over 150 miles of an expensive public railway, to a stamp mill, and numberless other foolish undertakings are all plainly visible to the inquiring investor, and all disgust him and make of the Lake of the Woods a laughing stock.

Since 1895 there have been, possibly, half a dozen experienced or competent mining men temporarily placed in charge of properties in this section, but even of these men but few had the experience, or the peculiar qualifications, which are necessary for the successful working of low-grade free-milling gold ores. The mining of iron ores, or of phosphates, or of precious metal *smelting* ores does not give the experience and the knowledge required to successfully handle the ores we have just described. Not the least important part of such management is the successful reduction of the values contained in the ores to marketable hullion, and the number of capable amalgamators, or of men having anything like an adequate knowledge of the metallurgy of gold, which this district has seen can easily be counted upon the fingers of one hand. It is within the knowledge of the REVIEW that not so very long ago the district was examined pretty thoroughly by a party of engineers from the south of the line, and that a generally favorable impression of the possibilities of the district was received, but the concluding remark of the chief of the party was, that he had seen no mill in Western Ontario from which he could not have saved a satisfactory salary by the simple expedient of putting in charge one of his own trained men.

Although we refer more at length in another part of this issue to the Central Canada Chamber of Mines, we may say here that this agency has not been without its adverse effect upon the gold fields. Our reasons are stated elsewhere, but it may be sufficient to say that a Chamber of Mines must base its opinions upon the actual bullion returns from well managed mines in its section, and that no district will be judged by the publication of an average of a thousand assays, or of many thousand assays of odd lots and rich samples brought into an assay office. To our regret we must also say that the broad gauge advertising methods of our contemporaries in that section, and the paragraphic puffs of prospects and men which are freely inserted, do not combine to impress people who have the money, the factor which is so earnestly desired by operators in that section. The public press is often considered as the Archimedian lever which moves the world, and not without cause, but it should be evident to the press of the Western Ontario fields that the publication and dissemination of unverified rumors, of highly coloured stories brought in by interested prospectors, and of golden editorials, will not bring in good management, nor capital, and will not assist the country, but will rather help to its damnation.

Mine Examinations.

The discussions which have been going the rounds of the mining press in America during the past few months, touching the duties of an engineer in the examination of mines, are evidence of an awakening on this important matter. We have previously discussed the same subject, and have endeavored to show what questions should be answered in a report upon a mine examination. One of the most serious defects in such documents is a lack of sufficient internal evidence of accuracy. The main thing needed is an abundance of facts, stated clearly and in great detail. Opinions are of very small consequence unless the engineer shows how, and in the face of what *data*, he arrived at them. It matters not how great may be the reputation of the engineer. He should not ask us to take his verdict without offering proof that he is correct. If the conclusions reached are defensible, they should depend upon a train of reasoning on observed facts and conditions, which when presented to another engineer should lead him to confirm the judgment given.

Neither is it enough to state the facts. We should know how they were obtained, and there are many terms which should be defined in order that we may know just what the engineer means. There is much difference, for example, in the meaning assigned by various engineers to the expression "ore in sight." Ore is not safely in sight until three sides are exposed to view for sampling, but where two sides only are revealed a triangular body may be assumed. Where only one side is shown, as where a drift extends for some distance on the vein, with no winzes or shafts giving a vertical exposure, the ore may properly be reported as indicated only.

Another serious defect in methods of examination is that, from lack of time, the engineer does not usually become thoroughly acquainted with the peculiarities of the ore deposit. By inspection he judges as to its variation in character, and by inflexible rule he endeavors to obtain an average, taking samples at regular intervals. In the case of ores of very uniform character this will do well enough, but uniformity is not the rule, and so this uniformity of sampling will not fit the conditions. The first essential for arriving at a safe judgment as to how the sample is to be taken is to become acquainted with every feature of the deposit. This can come by, first, making a careful mineralogical examination of the ore at a very large number of points in the mine, and, second, by making trial assays of the ore taken from a still greater number of points, representing all distinct bands or seams, ore adjacent to walls, and of selected pieces of apparently rich ore and of seemingly barren gangue. The possibility of sorting good from bad ore must be kept constantly in view, and efforts should be made to determine the proportions of each. Average values of ore in a vein may easily be misleading, and even mischievous. In fact, averages are difficult to reach unless the ore is very uniform in metalliferous contents throughout. It is evident that the conscientious engineer has a serious study before him when he undertakes to report on a mine, and that he must perform much preliminary work before he can even begin to take samples for final assay. To do his duty he needs an assay office at his command, and he will have work enough to keep an assayer constantly busy while he is making his examination. There are few cases in which an engineer is competent to intelligently sample a deposit until this exhaustive preliminary study has been made. We

insist on this because we believe that many failures following a commendatory report have been due to the existence of peculiarities and irregularities in the ore concerning which the engineer was totally ignorant, and which have upset all his calculations when practical operations were begun.

It is no doubt true that many failures have occurred from incompetent management in the mining and subsequent treatment of the ore, which should reflect no discredit upon the examining engineer. But this indicates another duty which the reporting engineer should not shirk. He should clearly point out what methods should be pursued, not in general only, but in as full detail as if he were laying plans for operating the property himself. This of course is a measure of safety for guarding his own reputation, but it is also a thing which the parties to whom he reports should obtain from him and pay for. The work of an engineer on a property which is sufficiently developed to be put on a productive basis is not completed until these problems have been fully determined.

Finally it must be iusisted upon that no engineer who takes any interest in any mining property, outside of his fees for engineering services rendered, is a safe man to trust in the delicate matter of reporting for investment. He may be ever so honest, able, and sincere, but it is human nature to look less dispassionately upon that in which we have a pecuniary interest than upon what belongs wholly to others. The ablest engineer in the world will fall into error in reporting on a mine unless he can approach his task in a perfectly cold-blooded judicial attitude.

The Montreal-London Gold and Silver Development Company, Limited.

The report of the annual meeeting of the Montreal-London Gold and Silver Development Company, Limited, as published in the Montreal press, affords legitimate opportunity for criticism of this company, which has now been before the public for more than three years. An excuse, if any excuse were needed, for dwelling upon its present depressed condition is found in the blind mismanagement of its directors, and in the depressing effect this mismanagement has had on investment in our most eastern province.

The Company, as first projected, was intended for the London market, (as witness the shilling shares) but when London proved inhospitable its promoter, whose previous knowledge and experience had been entirely confined to booming real estate, brought it back to Montreal where he was successful in obtaining the co-operation of some of the solid business men. The property had been examined by several mining men of greater or less prominence, experience, and ability, and by all it had been deemed valuable, and capable of yielding very profitable returns if *properly and economically managed.* Prominence was given to this fact by the president of the company in his apologetic speech to the shareholders at the recent annual meeting.

The promotion went with a rush, and the company found itself in possession of ample funds for the development and equipment of this mine, and for the other purposes for which the company was formed, which (succintly) were those of a development, or parent, corporation.

Under the skilful manipulation of its promoter and the rush of "boom" times the "Development" portion of the capital earned very satisfactory dividends; the stock attained a market value, for a time, of about 400 p.c. and for a long period was dealt in at 200 p.c. or over, but with the collapse of the mining share boom came the cessation of dividends earned (?) by the Development end, and the dependence of the company upon the actual working of the Dufferin mine, whose equipment and development had been proceeding for two years. Under the direction of the company's engineer, whose ability as a mine *examiner* is, and has been, unquestioned, but whose previous record as a mine *manager* had been costly to the Montana properties concerned, the equipment of the property was proceeded with, and at an expense of over $200,000 the property was equipped with a 30-stamp mill, new shaft house and surface buildings, including a machine shop, two new hoisting plants, two air compressors of large capacity, together with an electric lighting plant, and the other accessories of a well equipped plant. At the same time provision for operating this machinery by means of *steam* was made by the installation of seven large boilers in two nests; one of five, for the mine machinery, and one of two boilers for the large 250 h.p. tandem mill engine.

At this point the enginneer and his Board made their first mistake. The property was equipped with a most unnecessary and expensive plant, consuming enormous quantities of fuel for very low power effects, while the magnificent water power of the Salmon River only half a mile away was permitted to go to waste. Briefly speaking, an expenditure of fifteen tons of coal per day for power purposes was required when at least six hundred horse power in falling water was disregarded. The cost of the machinery plant above described, installed and set up was in excess of the amount of money which would have been required to have conserved these water powers, converted the power into electricity, and have conveyed it to the mine to have been used for the various operations of hoisting, compressing and pumping for which power is usually required at a mine. The installation of an electric plant to use this water power might have taken a longer time than did the installation of the steam power, and progress might not have been so rapid as it was by the use of steam. At the same time all the shareholders may not be acquainted with the fact that to run this steam plant to its capacity under ordinary circumstances requires the burning of 15 tons of coal per diem which coal, delivered on the grates of the boilers, costs no less than $5.00 per ton. With a mine running 312 days in the year it will be seen that the cost for fuel in one year would closely approximate the figure of $25,000, but the chairman, in his speech at the last annual meeting (January 8th), made the statement that by using water power instead of steam an annual saving of $35,000, or $3,000 a month would be effected. The point we wish to make here is, that this matter of the relative cost of water power *versus* steam could have been, and *should* have been, determined by the engineer and his board of directors, if they were worthy of the name, before any expenditure had been incurred for a steam plant. If it is apparent in the year 1901, more than three years after this plant was installed, that the cost of its operation is thousands of dollars a month more than the cost of water power, one can reasonably say that the directors, by failing to check up their manager, are responsible to the shareholders for a loss of over $100,000, which might have been saved to the company's treasury had electricity been installed at the beginning

During the two years (1898 and 1899) the public understood from inspired paragraphs in newspapers, and from statements made by officers at the annual meetings, that vigorous development of the mine was going on, and that ore was so abundant that 30 additional stamps were required; they were erected and completed before the annual meeting in January, 1900. In the meantime the company had succeeded, in the middle of the year 1899, in getting a mine manager whose efforts were certainly in the direction of decreased costs and general economy. But by this time treasury funds were low and there was no money to carry out the recommendations of the mine manager. Worse yet, this manager had to report that there was

no sufficient body of ore in sight to keep the large mill running, although the treasury funds of the company had been administered with an open and unheeding hand for two years *supposedly* in the development of large ore reserves.

About this time (January 1900) it was understood that the directors had sent a prominent Canadian authority on mine and mill management to the mine to make a full report upon the property and the administration; but if this was done the shareholders, so far as we have been able to learn, have never received that report nor has any reference been made to it by the company.

Immediately thereafter, or about April 1st, the management capped the climax by giving, without forfeit or consideration, an option on the entire property to an unknown and unvouched adventurer, who appears, by the last annual statement, a debtor to the company to the extent of $4,000. Associated as expert with the optionee was a mining man, who now is the company's manager at the mine. Under this gentleman's direction a test of 30 days duration was made. The result of this month's test was not particularly encouraging, but it sufficed to close the option, and after a short time the optionee advised the company that he did not care to go on with the option but would surrender it at once to the company. The condition of the company may be judged when it is understood (as we are informed) that the military optionee was begged to retain the option and not make public his refusal of it until "the market was in better shape."

After expending, as per the last annual statement of this company, over $460,000 (of which about $80,000 we are informed were paid for purchase of the property) the company has found itself in a bad financial way, and in the beginning of the year 1901 appeals to the public for new money to the extent of $150,000 to enable it to go forward. The confiding shareholder has been invited (and we believe will respond to the invitation) to contribute about 30 per cent. of his present allotment to the new issue of preferred stock.

We regret, not only for the sake of Nova Scotia, but also for the sake of the shareholders and the interests of good mining generally, that this property has been so mishandled. We are not interested in the shares nor in their present price (now very low), but we are interested in the fact that one of the best properties in Eastern Canada is being condemned although an expert of the Geological Survey of Canada and other disinterested, competent engineers have agreed in considering it one of the best gold properties in the East: The property has had an abundance of capital for a thorough and proper development and quite sufficient to have put it permanently upon the list of dividend paying Canadian mines, but this capital has been squandered, or badly expended, and the company is not likely to raise in the open market the sum required to *undo what has been done* and to do what should have been done. The trouble with the Dufferin mine is not *chiefly* with its tailings, and the installation of a cyanide plant under present conditions will not convert its losses into profits.

What the Dufferin wants, and what the shareholders should see that it gets, is honest, competent, energetic and experienced management: useless expenditure should cease, and extravagant or dilletante engineering should be declined. Competent advice can be secured if the directors choose to pay for it, and, although the Dufferin's days as a "boom stock" are over, its capacity to pay dividends when properly handled is, we are confident, as great as ever.

The Central Canada Chamber of Mines, an organisation largely composed of Winnipeg merchants, continues to make itself ridiculous by the absurd character of its literature. A recent publication by it states that the Dominion Government reports "that there are 10,000 men now at work within this area (the Lake of the Woods) as against about 2,000 a year ago." The Dominion Government never made any such statement. The total labour employed by Ontario mines in 1899 was 10,003 persons and the labour in gold mining (including by the way important industries in Hastings County) 611 persons.

Improvements in Hydraulic Classification.

There seems to exist a popular misconception of the function of hydraulic classifiers as an aid to concentration, which leads to a misuse of these important appliances, and thus in consequence causes many millmen to discredit them. We constantly hear them spoken of as hydraulic sizers. Now, this is a misnomer, and it often happens that to call a thing by a wrong name is to expect of it something it cannot perform. It is manifestly improper to call this kind of sorting a sizing. In no sense does it accomplish the work of a screen. If it did, it would be a very poor substitute from every point of view for true sizing appliances. It requires too much vertical height in a mill, and it has the further disadvantage of adding very considerable quantities of water to the pulp. Both of these disadvantages are serious, the latter perhaps the worst. There are few cases in which it is not inconvenient, for future treatment of the pulp, to increase its dilution. If the purposes of the millman can be subserved by sizing, then by all means use trommels or screens.

The hydraulic classifier is in effect a concentrator. It will not replace ordinary concentrators, for it will not, save under exceptional conditions, which are rarely economic, produce clean heads and tailings, but it effects enrichment, robbing the slimes finally of valuable mineral, thus obviating one cause of excessive losses in concentration. But it does more than this. It divides the fine sands into grades from which the valuable minerals may be more readily and accurately separated by other concentrators. This is accomplished by adjusting the rising water current in the classifier so that the smallest grain of heavy mineral in the grade issuing from the spigot of one compartment will settle at the same rate as a grain of gangue equal in diameter to the largest grain of heavy mineral in the same grade. The result will be that the grade issuing from the first spigot will be considerably richer than would have been the case had a screen been used for sizing between these two extremes of diametral sizes. The succeeding spigot discharges will be still more highly enriched, and the overflow (commonly designated as "slimes") will contain a relatively large proportion of gangue, with particles whose diameters will range from a size considerably greater than the smallest ore particles in the last spigot discharge, down to the finest pulp. The main advantage in concentration resulting from the use of classified sands consists in the fact that, though the largest gangue grains in the graded pulp will ultimately fall in water with a velocity the same as that of the smallest ore grains, the initial velocity of the ore grains will be less, owing to the less resistance due to their smaller size. Where the concentration is effected on contact-surface concentrators, such as vanners, buddles, riffle washers, etc., instead of in jigs, friction of the particles against the surface of the machine comes into play, and theoretically the friction of the equal-settling particles is the same, but the water currents exerting a greater force against the larger gangue grains move these more readily, thus causing them to separate as tailings, along with the smaller sizes of gangue which are more easily swept down by the currents. From the foregoing it will appear that a very accurate adjustment of the rising current in the several compartments of a hydraulic classifier is essential to produce beneficial results. This can be calculated by the ordinary Rittinger formulæ, or the same result can be reached by testing the overflow from each compartment by screens of proper size, if the limiting diameters for gangue or ore grains in any particular case are known to the millman. In any event it is not possible to attain really accurate results, which will be in the highest degree economical, by mere rule-of-thumb. Unless the millman possesses the requisite knowledge to handle these delicate appliances properly, he is almost certain not merely to use them at a dis-

advantage, but even to seriously prejudice his whole scheme of concentration by employing them. Rather than use hydraulic classifiers ignorantly, it is wiser to resort to screens and size the pulp, crude and unscientific though this method is.

Coming now to the relative merits of different forms of hydraulic classifiers, we find two prime defects inherent in the operation of nearly every form in the market. There are many patented designs, most of which are in no wise superior to the two best known models which can be made by any carpenter or machinist. The old Engis trough separator, practically the same as the Lake Superior trough washer, and the familiar inlet-discharge separator, are both fairly efficient, and are the types upon which most classifiers sold by makers of mining machinery are based, and in most instances the modifications serve only to catch the unwary, without offering any advantages over their prototypes. In these the principal defect is the existence, due to the jet of rising feed water, of a parabolic curve of equal pressure. The effect of this is to set up a circulation of grains that should be discharged with the overflow, the accumulation of these grains inducing the formation of banks that finally close together and clog the appliance unless a more powerful current is used than that theoretically required.

A superior form of classifier is that in which the separation occurs in a vertical tube through which a rising currents meets and sorts the downward falling pulp. The parabolic curve of equal pressure is here entirely overcome, but in its place are set up elliptical currents which seriously disturb the action, and produce inaccurate gradation of the spigot sands. The most important improvement in hydraulic classifiers made in recent years is that introduced by Prof. Robert H. Richards of the Massachusetts Institute of Technology, in which the irregular currents in the vertical tube classifier are broken up completely by the addition of feed water through curved channels in the walls of the separating cylinder, giving a rotary motion to the column of water in this cylinder, while at the same time it is moving as a mass in an upward direction. Immediately above and below this separating cylinder are vanes projecting radially from the walls of the tubes carrying respectively the overflow upward and the classified product, or spigot sands, downward. The vanes break up the rotary motion, above and below the separating cylinder, facilitating the even discharge of the two products. The results of elaborate tests with this appliance show an exceedingly accurate classification of sands, with very large capacity, and relatively small dilution of the pulp.

Another ingenious contrivance of Prof. Richards has apparently solved the vexed problem of classifying accurately the exceedingly fine pulp which issues as an overflow from ordinary classifiers. This consists of a long deep box, with a false bottom midway between the top and bottom of the box, perforated with a large number of round holes. Fresh feed water is added below the false-bottom, causing a slowly rising current through the perforations. The pulp is fed at one end of the box, and flows across the false-bottom, the heavier particles settling through the holes, whence they are discharged through spigots below. This device is excessively simple, and its results are said to be very remarkable. It requires but very little height, and the feed water added to the overflow is quite inconsiderable.

Canadian mining managers and mining engineers who are not already members of The Canadian Mining Institute are cordially invited to the annual meetings on 6th, 7th and 8th March next. They will be carried to and from Montreal for a single fare on the Canadian Pacific, Grand Trunk, Intercolonial, Quebec Central, and Canada Atlantic Railways on obtaining Convention Certificates from their ticket agents.

Geology "As She is Wrote."

The "Central Canada Chamber of Mines" has followed a well beaten track in its various efforts to attract attention from the public, but it is doubtful whether the Chamber is conscious of the amusement which some of its efforts have provided.

The Manitoba *Free Press* has furnished the medium by which many of the brilliant ideas emanating from the Chamber have first been introduced to the public, for which we sincerely hope the *Free Press* charged full advertising rates.

Some of these emanations have been reprinted by the Central Canada Chamber of Mines, and sent out broadcast; two have fluttered to our table, and they are remarkable specimens not only of choice and classic English prose, but of scientific learning and deep research.

We regret that we have not space to note at length the article on "Water Powers of Central Canada," which contains many remarkable statements, but the article on the "Geological Characteristics of the New Gold Fields of Central Canada" contains so many new and startling geological facts that we must note a few of them for the benefit of our readers. We also fancy that the staff of our Geological Survey will at once proceed to cast away all the information they now possess, and will make a fresh start from earliest principles.

The opening paragraph of this unique article is not only a model of clear and concise statement, but propounds a new theory:—"The "quartz and schists of these new gold fields are of extremely ancient "geological formation, being found *embedded in true fissure veins of "the Laurentian rocks of the 'Eozoon Canadense'* and are, *therefore*, "embedded much deeper in the bowels of the earth than any other "known gold field." What! oh what will Drs. G. M. Dawson, A. C. Lawson and W. McInnes say to this fundamental truth? For the first time (to our knowledge) we learn that the micaceous, hornblendic and felsitic schists of the region are "found embedded in true fissure veins," and that the Laurentian rocks are of the "Eozoon Canadense." After fully grasping this potent fact the reasons for the non productiveness of these gold fields is immediately clear,—all the *miners* in that region have been looking for auriferous *quartz*, let them cease at once and look for "true fissure veins" of *schist*, in "Laurentian rocks of the 'Eozoon Canadense'"; any other Laurentian rocks than those of the Eozoon Canadense will not do; and then, when found, we shall have plenty of gold.

Another one of our cherished ideas is shattered in this article. We had always been under the impression that these gold bearing deposits were somewhat restricted in horizontal dimensions, but we have been mistaken, for this writer tells us that they are "miles long and exceptionally wide, with numerous large gash veins intersecting at intervals." But where the public have been most fooled is in the average value of these "reefs," which the learned author states is $11 per ton. Shades of the Homestake! Miles long, exceptionally wide and worth $11 a ton! We are now firmly convinced that Canada can sell gold for the same price as brass, and at a great profit, for these articles are endorsed by the Central Canada Chamber of Mines, and therefore *must* be correct.

But our dynamic geology is also at fault, for in the very lucid paragraph relating to the origin of these fields, we learn that the "igneous rocks" "owing to greater contraction in cooling—have been drawn away from the harder granites leaving the extensive fissures open to the molten matter, through which flowed the auriferous quartz, schists, and traps."

To our mind no geological picture can beat these words of "Africandencia"; we can shut our eyes and see the "igneous" rocks

"drawing away" from the cold, cold granites; the yawning fissures are opened, when suddenly, all jumbled up together, melted auriferous quartz, schistose rocks, and amorphous traps spout from the fissure and overflow "into extensive valleys forming immense *overflows or dykes*, such as the Scramble and Hammond Reef" mines.

These are but a few of the pearls of originality contained in this article, but we must not close our notice without reference to the paragraph in which conclusions are finally reached, thus—"The reefs "opened out are certainly not surface float or drift" (the logic of this is unassailable) "or deposited in solution, neither is it reasonable to "suppose they fell from the clouds" (we agree fully, it is *not* reasonable), "they clearly came from below and are *therefore* unquestionably "fissure veins in the true geological sense." Let us point out, for the benefit of young and unknown engineers, that the last paragraph is an easy answer to that often vexatious question—What is a fissure vein? If your vein is not float or drift, or "deposited in solution," or has not dropped from the clouds it must have come from below and "*therefore*" must be a "fissure vein in the true sense."

We are suspicious that the Central Canada Chamber of Mines has been asking money grants from the Ontario and Dominion Governments for the secret purpose of providing confined lodgings for its promoter and secretary.

The London and Globe Smash.

The closing days of the last century will be memorable for the collapse of the London and Globe Finance Corporation, an enterprise in which Canada is to some extent concerned inasmuch as it is the parent corporation and promoter of the British America Corporation, the Le Roi Mining Co., Columbia and Kootenay, Great Western Mines, and other subsidiary ventures operating mines in the Rossland district, British Columbia, This failure of the "Whitaker-Wright" group, so called because they owe their existence to a gentleman of that name who has become famous for the greatness of the scale on which he has engaged in the business of floating mining and financial undertakings of various kinds, is ripe in its lessons for the British investing classes as to the vanity and hollowness of much of our later day high financing in joint stock company affairs.

A brief review of the history of this undertaking will not be without interest to our readers. In 1895 the London and Globe Finance Corporation (Limited) was formed with a capital of £200,000, of which £5,000 was in so-called deferred or founders' shares, of 1s. each, entitled to half the net profits after paying 10 per cent on the ordinary £1 shares, and providing for a reserve fund. It was to engage in promoting companies and other financial business. Its directorate, management and all the rest of it were practically identical with those of the West Australian Exploring and Finance Company, which was engaged in the same line of business, so that the two concerns were at once rivals and brothers. This position could not be long maintained, and, as happened in similar circumstances with the "Bottomley" finance companies, they were, in 1897, amalgamated, the title of the London and Globe Finance Corporation being retained. The capital was at one stroke increased to £2,000,000 in shares of £1 each. Then commenced a long series of more or less ambitious mining and other promotions, the first venture being the British American Corporation (Limited), registered in October, 1897, with a capital of £1,500,000, which was also to engage in the promotion business in British Columbia. This was followed by nine other undertakings, purely mining, three being launched in 1898 with an aggregate capital of £1,871,214; two in 1899 with £1,450,000, and four in the past year with a combined capital of £2,250,000, which brought up the total to the magnificent sum of almost £10,000,000, the great bulk of which went to the vendors.

So long as the London and Globe Finance Corporation confined itself to floating new ventures—whatever their real intrinsic worth—it presented an appearance of prosperity. For the first eighteen months of its career in its new shape it paid a dividend of 15 per cent. and for the year ended the 30th September, 1899, 10 per cent. These distributions absorbed £500,000. On the other hand, it had to write off an exactly equivalent amount for depreciation of securities during the same interval, after performing which operation its share investments stood on the books at £1,813,231. But for the year ended the 5th December, to which the last accounts were made up, there was no dividend, and a round million sterling more had to be written off for losses on investments After allowing for this extensive scaling down operation, the shareholdings in sundry companies, apart from £621,430 in the Baker Street and Waterloo Railway Company. figured for £2,332,632, so that the company must have added enormously to its interests in other ventures during the year. What may be their exact nature cannot be said for certain, because the directors have been careful not to publish a list of the securities held; but from the character of the business it has been engaged in during the last few months in the London Stock Exchange it is safe to assume that the whole, or practically the whole, of the shares are those of the several companies it has floated. Again, it would be impossible to say at what prices those shares were acquired; yet we may further assnme that as to a large proportion of them, they were bought at considerable premiums. Take, for example, the case of the Le Roi No. 2 Company, which was issued as recently as June last with a capital of £600,000 in shares of £5 each. These were not long since "rigged" up in the market to about £28 each in order to "corner" the "bears." In the process of carrying out this operation the Corporation must have become possessed of a considerable number at steadily increasing quotations. On 28th December they stood in the market at £23, and on the following day they were nominally quoted at £1 to £3—that is to say, at a clear drop of over £20 per share. The "shop" has the shares, and if it wanted to sell them it would have to accept about four or five shillings in the pound for them on the nominal price, and about a shilling in the pound on what may have been paid for the shares while they were being "rigged" in the market. The shares of the Kootenay Mining Company, which was floated in July last with a capital of £400,000 in shares of £1 each, were worked up in the same fashion to between £8 and £9. On 28th December they stood at £6, and on the following day they were down to £1, 10s. The shares of the British American Corporation, formed in 1897 with £1,500,000 of capital, stood not long since at 30s., and are now at 10s. each, and those of the Le Roi Company with a capital of £1,000,000 in £5 shares, which stood at £9, are now back to within a small fraction of their par value. Standard Exploration shares are down to about 3s., and the shares of some of the other companies in which the Corporation is interested have no quotation whatever.

Now, in the bolstering up of the market implied by the immense premiums to which the shares of the several companies just enumerated were driven, the London and Globe Finance Corporation has taken the leading part. A grand "coup" was arranged for the final settlement of the year. Huge blocks of shares were bought, and it was ostentatiously bruited about that they would be paid for and taken off the market, whereby the "bears" would be once more severely punished. But the Corporation, uot having the needful money, and the financial houses and banks which had agreed, provisionally, to furnish it, becoming at the last moment distrustful of the business, drew back, so that being thus stranded, the Corporation instead of paying for the

shares, became a defaulter. It is said in the market that it was under engagement to take up shares to the extent of between £600,000 and £700,000, and that its "differences" amount to a further sum of about £400,000. The suspension is said to have fallen upon the London Stock Exchange as a "bolt from the blue," though by those who have watched the game from the outside and bore in mind the collapse of the "Bottomley group," which owed its ruin to the pursuit of an exactly similar class of stock-jobbing enterprise, the incident was fully anticipated.

The question everybody concerned is now asking is: How is the affair going to work out? The Corporation naturally hopes to meet all its engagements in time. In the case of the "Bottomley" break-down there took place a great shuffling of the cards, the outcome of which was a consolidation of the several companies involved, the calling up of fresh capital, and the creation of debentures and preference shares, which were accepted in part payment by the creditors. As regards the London and Globe Finance Corporation failure there is nothing to consolidate, but much to reconstruct. It must have assets ample enough an more to meet its liabilities, if judiciously nursed and disposed of. As to the moral of this business, it is clear enough—so clear, indeed, that to dwell upon it must be felt to be quite superfluous. But it is by no means as clear that the moral will avail much to warn investors against participating in these ricketty gambling ventures whose main attraction seems to be the eminence of the people who undertake to guide their destinies.

Query: When was Whitaker Wright? When he took a Duffer(in). —London *World.*

Mining in Nova Scotia, 1900.

Coal mining has shown good progress in Nova Scotia during the past year. The sales amounted to 2,995,000 tons as compared with 2,637,937 tons in 1899. This increase was shared in by all the districts. The most notable shipments were 624,500 tons to the United States, the largest previous shipments to this market being 465,194 tons in 1865.

The practical completion of the furnaces and coke ovens of the Dominion Iron and Steel Company at Sydney mean a largely extended consumption of coal during the year 1900. The coke made here has proved equal to Connelsville.

The Nova Scotia Steel Co. has acquired the holdings of the General Mining Association, well known as the Old Sydney Mines, and are building coke ovens of the most approved pattern, to supply coke for their furnace in Pictou County and also as part of a proposed large steel works.

The Dominion Coal Company has three new collieries under development which will materially increase their output. They have also completed a large Robins belt conveyor at Louisburg which will load from pockets and very greatly increase their shipping facilities. On the western side of the island extensive developments are in progress in the Port Hood and Broad Cove coal districts, which are most favorably situated for the coal trade of the Gulf of St. Lawrence. In Pictou County the usual conditions of steady work have prevailed, the only new work being the preparations of the Nova Scotia Steel Co. to open a seam on one of their coal areas said to be specially suitable for use in convertors.

In Cumberland County the Springhill Collieries have continued the exploration of the extension of their seams, and have increased the underground development until they are able for some years to come to meet any requirements of the trade. The Joggins mines have also improved their equipment and capacity.

The gold mines have as a rule not shown any marked increase of activity, the output being 31,110 ounces against 27,772 ounces during the preceding year. The Libbey, Richardson and other established mines continued to work steadily, but few new districts came to the front. As about 65,000 tons were crushed the average yield was in the vicinity of one-half ounce to the ton. At Harrigan Cove 1813 tons yielded 1,705 ounces; and 212 tons from Renfrew yielded 3,403 ounces. The stability and value of mines working medium grade ores was again demonstrated in the Stormont, Brookfield, Sherbrooke and other districts.

The production of iron ore was small, being confined to about 16,000 tons from the Nova Scotia Steel Co's mines at Bridgeville. This company also imported about 30,000 tons from Newfoundland, and made about 25,500 tons of pig at Ferrona. The Dominion Iron and Steel Company rely entirely upon their Newfoundland ore, and imported it is said about 100,000 tons. During the year the services of a Government drill were secured by parties interested in the Torbrook district, Annapolis County. These parties traced several valuable beds of red hematite from 2 to 12 feet in thickness for a distance of about five miles. Several holes have been put down and the ore proved to continue to depths of from 300 to 500 feet. The work has shown the presence of many millions of tons ore of good quality.

At Arisaig, in Antigonish County, and at Whycocomagh, in Inverness County, a good deal of work was done, adding materially to the proved extent of the numerous deposits known thete.

The Copper Crown Company completed their copper furnace at Pictou, but experience has led them to make alterations to increase its efficiency. During the season a few hundred tons of ore were taken from their Colchester and Cumberland mines. The Polsons Lake and the Lochaber deposits, in Antigonish County, received some attention. At Cape d'Or, in Cumberland County, a shaft is being sunk in the trap to cut a layer of ash reported to carry considerable copper values.

The Barytes mine at Cape Rouge, Inverness County, yielded 783 tons of mineral.

Incomplete returns show that about 1,150 tons infusorial earth were treated, chiefly by the St. Ann's, and by the Bass River Silica Companies.

In addition to the usual quantities used locally, the Nova Scotia Steel Co. quarried 24,300 tons of limestone, and the Dominion Iron and Steel Co. used a large quantity for concrete work taken from their Georges River Quarry, probably about 75,000 tons. In addition large quantities are being quarried at that place and at Marble Mountain, West Bay, for the company's furnaces.

Gypsum returns so far show that the year's production was slightly behind last season's, due largely to the non-working of the quarries in the Baddeck District. It is expected that these quarries will resume work next year, and that the production will rise from 122,281 tons to its normal figures of about 150,000 tons. In addition to the shipments of this mineral, considerable quantities are manufactured for local use, ground for house work and used in the manufacture of fertilizers. A few tons only of manganese were shipped, although it is believed that deposits of considerable value exist in the New Ross district.

Unusual activity prevailed in the brick yards and quarries, and the demand, in the case of the former, was continually in excess of the production. Deposits of valuable clay in the Musquodoboit Valley suitable for firebrick and the finer grades of pottery are being tested and proved.

Mining in Quebec, 1900.

The mineral industry of the Province of Quebec comprising important operations in the production of asbestos, copper pyrites, chromite, iron, mica, graphite and other minerals, has had a satisfactory year, and while the mines are not listed on the stock exchanges, nor have they had that prominence in the press which has characterized less stable enterprises in other sections of the Dominion, the industry, as a whole, is on a sound footing and may be said to have yielded profitable returns to the operators.

We are indebted to the courtesy of Mr. J. Obalski, M.E., Inspector of Mines for the Province, for particulars of the development of these industries during the year from which these notes are compiled :—

IRON INDUSTRY.

The remarkable expansion of the iron and steel industries of the Dominion and the great interest which has been excited in this industry, has not been without effect in Quebec. The blast furnaces of the Canada Iron Furnace Co. at Radnor Forges, and the McDougall plant at Drummondville, have been actively operated, the output of the latter furnace having increased to something like 35 tons of pig per day. The charcoal pig iron manufactured by these companies from the bog iron iron ores of the Province is well known to be of a very superior quality and in spite of its high price it commands a ready sale in American and European markets. Shipments of magnetite to Pennsylvania were also made regularly during the summer months from the Scott Mine near Hull, in the County of Ottawa. Considerable interest too was taken in the deposits of magnetic sand located on the north shore of the St. Lawrence River as a likely source in the near future of supplying the large furnace plant being erected at Sydney, Cape Breton, for the Dominion Iron and Steel Co. After a careful investigation I am convinced of the great extent of these deposits and with proper metallurgical treatment they will doubtless be successfully exploited in the near future.

CHROMITE.

The mining of chromite in the Eastern Townships has been conducted on much the same lines as former years. The mill of the Coleraine Mining Company continues to yield a concentrate of about 50 p.c. which finds a ready market. Ore has also been shipped from the Black Lake mines to the electrical reduction works at Buckingham for the manufacture of ferro-chrome. A new deposit of some note has been opened on lot 17 in Range A of Coleraine by Messrs. Joseph Nadeau & Co.

OCHRE.

This mineral is mined and prepared at St. Malo, near Three Rivers by two companies. The Canada Paint Company, one of the operators, also utilizes the sulphate of baryta taken from lot 7 in 10th Range of Hull.

COPPER PYRITES.

The ores of the Eastern Townships continue as in the past to be exploited mainly by the Eustis Mining Company at Eustis, and the Nichols Chemical Company at Capelton. The extensive operations of these companies are well known. Some prospecting has been carried on during the year in the vicinity of Sherbrooke, particularly on the Suffield and Sherbrooke properties and also at Ascot where some work has been done by an American company. Dr. Reed has also taken out some rich bornite from the old Harvey Hill workings.

ASBESTOS.

The principal mining industry in the Province, and one of the most important in Canada, continues to be the production of asbestos from the celebrated mines at Thetford and Black Lake. A strong market and good prices have greatly stimulated activity in these districts and at date over 1,000 persons are employed. New milling plants are being erected by the Johnson's Company at Thetford and Black Lake. The Beaver Asbestos Company has reopened its mine at Thetford and under the management of Mr. Harry Williams is now installing an up-to-date asbestos plant. It is understood that Mr. R. H. Martin, of the H. W. Johns Manufacturing Company, New York, having acquired the interests of a number of the members of the old corporation is the principal spirit in this enterprise. The well known mines of King Bros. under the management of Mr. Bennett, and the large works so energetically managed by Mr. George R. Smith, M.L.A., are also being extensively operated. A view into the dark cavernous pits, now formed into one colossal opening in the Bell Company's workings, through the removal of their separating walls is extremely picturesque. The pits vary from 100 to 150 feet in depth and the cliffs frowning above them are sprinkled with derricks along whose steel cables as they descend into the pits run the swaying carriages bringing up their cradles of stone which are dumped into waiting cars and carried to the separaters, crushers and dump. The scene on the floor of the pit is full of action and gangs of workmen at various points are blasting, drilling or prying open the ledges and exposing new surfaces of the serpentine.

In the Black Lake district Dr. Reed has reopened his mine and is contemplating the erection of a mill; the Union Mine under Mr. Crabtree is regularly worked, while the old workings and plant of the Glasgow and Montreal Company have been taken over and are operated by the Canadian Asbestos Company. At Danville the operations of the Asbestos and Asbestic Company, Limited, have been greatly hampered and reduced by the destruction of their fine mill by fire. A temporary plant has been installed and a new one of large dimensions is spoken of. Small quantities of this mineral were also shipped from Ottawa County. Altogether, the asbestos industry may be said to be in a most flourishing condition and will compare most favorably in importance with any other mining industry in the Dominion.

GRAPHITE.

Notwithstanding a strong market the production of graphite has been disappointing, the only plant in active operation in Quebec being that of the American Graphite Co., near Buckingham, operated by an American syndicate. In the vicinity of Calumet, County of Argenteuil, a new enterprise, the Keystone Graphite Company, has been mining a deposit of high grade mineral the output being shipped to the United States where good prices have been realised. The Walker Mining Company's mill, owing to internal troubles among the owners, still remains idle.

MICA.

For the first six months of the year the mica industry, which is mainly confined to the County of Ottawa, showed considerable activity, the mineral being in good demand for electrical and other industrial uses and prices, notably for the smaller sizes, were better than in former years.

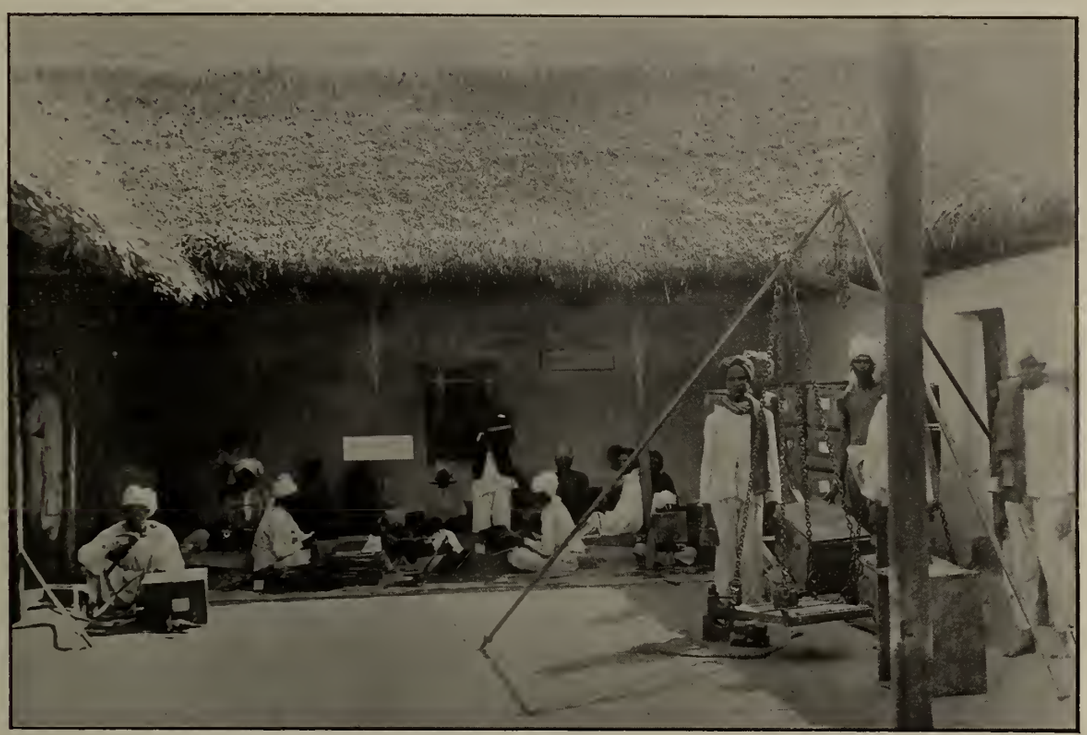
The principal producers were the established undertakings of Blackburn Brothers and the Wallingford Mica Company in Templeton, the Glen Almond Mica Company, near Buckingham, Fortin & Gravel and the Nelles Mine in Hull. Desultory mining was also carried on on a large number of areas in Ottawa County. Towards the close of the year the market weakened, owing to causes not very well understood, and shipments fell off considerably. This depression, we believe, however, is only temporary. It is understood that arrangements are well forwarded towards the organisation of a combined pool on the part of the mica producers in Quebec and Ontario

Mica Mining in India. Open Cast Workings, Shah Mine, Madras.

Mica Mining in India. View of Open Cast Workings, Pollimite Mine, Madras.

Mica Mining in India. Corpalli F Mine, Madras.

Mica Mining in India. Indians Sorting Mica.



Mica Mining in India. Indians Packing Mica.

Mica Mining in India. Sergeant D Mine, Madras.

Mica Mining in India. View of Shah Mine from Foot of Hill.

Mica Mining in India. Indian Laborers Splitting Mica into Films.

Mica Mining in India. Indian Laborers Cleaning and Trimming Mica.

Mica Mining in India. Sorting and making Mica into Bundles.

Mica Mining in India. Mica from the Mines being Weighed by Natives.

Kuddusabad Depot, India. General View of Mica Bearing Country at Shah Mine.

New Colliery of the Gowrie & Blockhouse Collieries, Limited, at Port Morien, C. B.

Aerial Tramway Plant used for Shipping Coal from the Colliery of the Gowrie & Blockhouse Collieries, Limited, Port Morien, C. B.

Loading Station on new Aerial Tramway of the Gowrie & Blockhouse Collieries, Limited, at Port Morien, C. B.

Caledonia Colliery, Glace Bay, C. B., one of the properties of the Dominion Coal Co., Limited.

with the object of maintaining a standard price for this valuable mineral.

OTHER MINERALS.

Borings for petroleum were continued in Gaspé by the Canada Petroleum and other English companies operating in that field. A refinery was also erected but no information is available of the success or otherwise of these undertakings.

The old Wright galena mine at Lake Temiscamingue was taken over and worked by the British and Canadian Lead Company, Limited, an English syndicate having a capital of £120,000.

In the Beauce gold district two shafts are being sunk on the Gilbert River, one of them by the Beauce Syndicate, Limited, an English campany formed in 1899 to acquire the property of the McArthur Bros. Co., Limited, and the other by a local company.

The production of structural and building materials, as in previous years, constituted an important factor in the mineral production of the Province.

NOTE.—The increased output of pig iron should be credited to the Canada Iron Furnace Company at Radnor Forges, and not to the Drummondville Furnaces as stated.

The Crow's Nest Coal Co.

We believe that one of the books which achieved popularity a few years ago in certain circles bore the suggestive title of "The Indiscretions of a Duchess." In another sphere with which we are more concerned the sensation of the month has been the publication of an interview which might be fitly described as "The indiscretion of a Vice-President." To set the mining and railway world by the ears may not be a very difficult or altogether a very unusual achievement for a newspaper man accustomed to yellow journalism; but for the President of a sober, respectable paper like the *Globe* is enough to make honest men like George Brown and Alexander Mackenzie turn in their graves and say, with Hamlet, "To what base uses, &c."

This is the record of Mr. Robert Jaffray, one of the fathers of the Crow's Nest Pass Coal Co. and erstwhile managing director. When one evening after dinner he "granted" an interview to a *Star* reporter at the Windsor, the public learned for the first time that peace and harmony no longer reigned in a once happy family. No, the calumet of peace was flung into the fire and the Hecla of fury blazed up like a volcano. The Jews no longer were to have dealings with the Samaritans. All friendship was a thing of the past, it was to be war to the knife, and with the latent instinct of the professional politician the irascible old gentleman added, "I should like nothing better than a political campaign with the C. P. R. as opponents." The Canadian world opened its eyes very wide next morning when reading these bellicose vaporings, but closed them again in sweet and blissful confidence that the "day of judgment" was postponed when first the managing director—Mr. Elias Rogers—and then others of the directors politely but firmly repudiated their colleague and by the manner of their disavowal made him look as cheap as thirty cents. With this effective *coup de grace* the personal equation falls into the back-ground and we are left to ponder—as we hope the discredited and discomfited instigator will—on the unwisdom of assuming the role of a lion in the garb rendered immortal by Æsop's fable.

There is, however, a great deal of interest for the public in general and the mining world in particular in matters which have been stirred up by this "storm in a teapot," for as an esteemed contemporary has well put it, "when politicians fall out honest men get their dues."

The Toronto *Globe*, which is presided over by Mr. Robert Jaffray, and which was an out-and-out defender of the Crow's Nest deal, is burdened with a respectable past and at times is driven to "compound for sins it is inclined to by damning those it has no mind to;" and so driven, no doubt, by little twinges of conscience at the thought of having harbored a too kindly estimate of railway promoters in the past, it has lately inaugurated a campaign in favor of a "Railway Commission" designed to investigate and rectify all the inconsistencies that railways are subject to. This may be a laudable object, and possibly a nccessary one, and judging from present indications it may not improbably be achieved; but unfortunately the *Globe* is handicapped in this matter by a past, we mean its recent past, in which it has been the instigator and, largely by its advocacy, the creator of one of the greatest monopolies in Canada, and with it as its only defence the very line of railway which is now the chief object of its attack. Then, it is further handicapped by the positive utterances of the leading men of its party in the very recent electoral campaign to the effect that the Crow's Nest line had solved the question of cheap rates in British Columbia. It is further very badly handicapped by the fact that its President has been enriched to date to the extent of nearly $1,000,000 and still holds stock in the coal company which at the market price is worth over $750,000.

Then it is singularly unfortunate for the reputation of the *Globe* for consistency that this onslaught on the C. P. R. should have been waged just at the time that their President made an attack on them avowedly in the interests of the coal company. The latter are said to be anxious to secure railway connection with the Great Northern for the purpose of entering southern markets. This is a laudable ambition and one not unlikely to be gratified. If it can be shown that it would be a benefit to the Province and not merely to one corporation it should be granted. The onus of proof rests with the applicants. If, however, the project is being pushed and political support secured by the chief members of the coal company simply to furnish them at the country's expense with a weapon to fight the C.P.R., the matter assumes another phase. Canada has already given these monopolists a property valued at $20,000,000. Dr. Selwyn estimated that it contained 2,000,000,000 tons of coal. Their charter secures them $2 a ton at the mine. The published reports of their experts estimate the cost at $1 or less. A very moderate output in a year or two would be *1,000,000* tons a year, which would represent 5 per cent on *$20,000,000, and this in perpetuity.* We doubt if the country has yet begun to understand what it gave these men practically for nothing.

Now, what was Canada supposed to get in return? First, *50,000* acres of coal lands in reserve. Have these yet been located and appropriated by the Government? No. Why? Oh! it may be argued it takes time to complete the surveys. Yes, but meanwhile these monopolist patriots who were so willing to protect the interests of the Province have covered the areas on every creek, and it would take a clever man to find an opening where practical access can be had to the coal. If steps are not taken quickly the country will ultimately get nothing but barren land, or coal outcrops near the top of the mountains only accessible to an eagle or an air-ship.

Then British Columbia was to have cheap fuel and this was secured by a clause inserted in the charter fixing the price at $2. As to whether this is cheap or not is a matter of opinion, since in the neighboring State of Montana, where wages are higher, the average selling price of coal last year was $1.59. It is clear, however, that British Columbia is entitled to get what was bargained for. This, however, she has not had. The price charged to all smelters in British Columbia except the C.P.R. for coke is $5, which is equal to at least $3 for coal. These philanthropists have always boasted their anxiety to assist in giving British Columbia cheap smelting fuel, the one thing essential and the strongest consideration in the granting of the Crow's Nest charter. They prove it by charging $1 a ton more than they are entitled to, and we have no

hesitation in saying that every British Columbia firm which has paid this dollar should have a good case to legally recover it. The public press has stated that the coal company has further proved its sympathy for Canadian industries by selling coke cheaper to American smelters. This, if true, is interesting, and only goes to show that even politicians need watching when they become monopolists.

The conclusion of the whole matter is that the Government should not only be content with a railway commission, but should carry the matter further and give these gentlemen a little of their own medicine. A commission to see how the Crow's Nest charter has been carried out, whether its provisions have been violated as alleged, and in any case to protect the country in the prompt and advantageous selection of the 50,000 acres of coal lands. It was never intended that this latter should be a reserve in name only, and it might as well be in the planet Mars as in an inaccessible peak of the Rockies. Yes, by all means let the *Globe* have a commission—two commissions.

Another Slump in War Eagle.

In a few weeks Canadian investors would have been preparing to celebrate the anniversary of the first sensational slump in War Eagle Stock, but the President, Mr. Gooderham, has seen fit to anticipate the actual date, and either intentionally, or inadvertently, to furnish the material for a repetition of the fiasco of February, 1900.

The medium chosen was a Toronto evening paper, which, on the evening of the 15th inst., published a lengthly interview with Mr. Gooderman, in which that gentleman seems to have made the same kind of a bad break as the Vice-President of the Crow's Nest Pass Coal Co., flinging around reckless charges against the C. P. R, and threatening vengence dire and terrible. We imagine that Corporation is quite able to take care of itself, and if the issue had been confined to it and Mr. Gooderham, we should have said, leave them to fight it out, but the latter saw fit in the course of his interview to assert the impossibility of making any satisfactory terms with the C. P. R. for their Trail Smelter, and emphatically predicted the closing down of the Centre Star and War Eagle mines as a consequence. It is not surprising that the market should interpret this as indicating the near reproach of an end which has long been expected, and the natural consequence was that on the following day (the interview being repeated in the morning papers) War Eagle Stock fell from 85 to 54, and many people unloaded at rates very little above the latter figure.

On the evening of the 16th, however, Mr. Gooderham seems to have discovered by some occult means, that he had been misreported, or, to quote the somewhat ambiguous wording of his denial, "that the statements of the reporter were so misleading that he could not be responsible for them."

He then went on to reassure all persons interested that he had no quarrel with the C. P. R., nor any intention of closing down the mines. As to whether the reporter or Mr. Gooderham is correct matters very little; but what does concern the pnblic, and especially the unfortunate holders of stock, who in a panic rushed to unload at a serious loss, is why Mr. Gooderham, who must have been acquainted with the misleading report on the evening it appeared, should have allowed twenty-four hours to elapse before taking steps to correct what he now declares to be a false report. If he had taken steps, as any right minded business man would have done, to contradict it the evening it appeared, then even if the first report had found its way into the papers the following day, the denial would have accompanied it, and discounted its effect upon the market. A year ago the Montreal Stock Exchange censured Mr. Gooderham for conduct not more questionable than this, and although they pressed him very hard, he was only able to give a reply which they characterized in an official document as "not satisfactory." Possibly the Stock Exchange will not think it worth their trouble to waste any more attention upon a President who is utterly unmindful of the responsibilities of his position. Meanwhile, however, there are other aspects of the question which will not be altogether foreign to the minds of our readers. No one who has followed the history of the War Eagle mine would be surprised at an announcement of its permanent abandoment at any moment. It is ancient history that the General Manager, Mr. Kirby, who is a thoroughly efficient and practical mining engineer, practically turned it down in his last annual report. He told the Directors in so many words, "you have no ore reserves, the future of your mine depends upon development disclosing pay ore." Since then the year's prospecting has been done, and from the monthly reports issued by Mr. Kirby, it is perfectly clear that no considerable quantity of pay ore has yet been discovered. In fact, in his report of November, he specifically stated that there was no change since his last annual report. This is confirmed by mining men who reside in the camp, and who know perfectly well what is going on. Several attempts have been made during the year to create the impression that things were looking up, followed by efforts to boom the stock. Later a report was circulated portending an amalgamation with the Centre Star, but the stock holders in the latter must have found out long ago, that they would only be saddling themselves with a white elephant or something worse, if they shouldered the War Eagle mine. Whatever the future may be it is certain that the War Eagle, on its own merits, can never pay even a modest dividend upon its present capitalization, and it is more than doubtful whether it can even carry its dead charges.

By associatiag it with Centre Star, and smelting the wet ores of the Moyie district with the dry ores of the Rossland Camp, it may be possible to carry it on a little longer, and if the option now taken by the Gooderham and Blackstock Syndicate upon the Trail smelter is converted into a purchase, it may have a short lease of life, but it will always be a dead weight, and according to present showing, there is not the slightest justification for entering into any scheme in which it is designed to become a factor.

COAL MINING AND TRADE.

Since our last issue there has been an insipient strike, among the coal miners of Nova Scotia, which might have resulted in serious consequences for the industries of Eastern Canada which are entirely dependent upon the coal mines of the Maritime Provinces. In view of the efforts now being put forward in anticipation of the new steel industry to be started during the present year at Sydney, it would have been little short of a calamity if serious labour troubles had intervened. The strike only lasted three days and resulted in the concession of an immediate advance of 12% to the miners.

The Cape Bretoners did not join their fellow workmen of the mainland, presumably because wiser counsels prevailed, although the fact that they had received larger advances since the boom in trade began, may also have had some weight. The bone of contention in Nova Scotia was not so much with respect to the immediate advance as to a prospective further 10% in May next. There seemed to be little disposition on the part of the employers to question the right of the men to the present advance, but it was reasonably contended that the great boom in the iron and coal trades, which had characterized the year 1900 all the world over, has unquestionably subsided; and it is impossible to say how much prices may yet fall. In view of a possible depression it was felt that circumstances might render it out of the question to make a further advance this year; however, as matters now stand it is waived, and no doubt the men will take careful counsel before renewing the application. It cannot be said that the miners of Nova Scotia are over-paid, although if they can obtain regular work

they can earn as much in a year as coal miners in any country. The high wages and abnormal selling prices of last year are not a fair criterion from which to judge. It is more reasonable to take the average rate of wage, over a long term of years, and from statistics recently published it may be seen that the average rate of miners' wages in England have for twenty years past been 20% above the standard of 1870. Until the beginning of the present boom miners' wages in Nova Scotia were practically on the same level as in 1870, and as the cost of living is undoubtedly more now than thirty years ago, it does seem as if the standard might fairly be raised to something like the same extent as prevails in the Old Country. In addition to this the men consider themselves entitled to something for the recent high prices prevailing, and this seems to be the rock on which operators and employees split. While it is true that coal was sold as high as $4.00 per ton in the early part of last year, and while probably the whole production of the year could have been sold at from $3 to $4, as a matter of fact the mines had already mortgaged their outputs to such an extent that they were impotent to take advantage of these high figures, and according to the best authorities the average selling price for the year would not exceed $2.25, an advance from normal figures of about 50 cents. If these contracts had not heen made it would have been easy to concede larger advances in wages to the men ; but to have done so, under existing circumstances, would have involved a loss. Nor can the managers be blamed for this because, as is well known, the custom of the country is to contract with all large purchasers for the year's supply, and we hardly see how this is to be avoided.

If some method could be adopted similar to an automatic sliding scale, by means of which wages would be affected more promptly in sympathy with the fluctuations in the market price of coal, it would be much better for all concerned. as it has often happened, at any rate abroad, that the tide has turned before the men have received the advances to which they would appear to be entitled. Probably the most successful sliding scale in existence among miners has been in operation in South Wales for a quarter of a century. Under this arrangement accounts are audited every two months, and the wages adjusted automatically, according to the fluctuation in price. Where, as might be the case, largely in Nova Scotia the coal is consumed by the producers, the price is determined by the figures at which it is sold to outsiders.

Whilst on this subject we might call attention to an admirable arrangement which has been working now for some time in the State of Illinois. We refer to a commission consisting of representatfves of the Illinois Coal Operators' Association and the United Mine Workers Association. To this commission all disputes are referred promply, often times by wire or telephone. The decisions of the commission are received without question, and the important matter of a properly constituted and authoritative tribunal seems to have heen solved. It is especially worth noting that in this instance after some delay, the important, and as we think crucial question of recognizing not only the status of the Union, but of all officials duly appointed by the Union, whether working miners or not, was conceded. This matter has, during recent years, been the subject of more strife between capital and labour than any other. We have always maintained that it would have to be met in a fair spirit, and the operations of the Illinois Commission will be watched with interest by all connected with mining, as having an important bearing upon the future of the labour market.

The statistics of the year's coal trade in the United States have been published and contain several features of interest to our readers ; the most striking of which is the low price at which the coal has been sold at the mine. This is a matter pregnant with suggestion to Canadians, as it lies at the very root of the national prosperity of our industries. If our American cousins have been able, not only to outstrip Great Britain in the production of coal by 50,000,000 of tons last year, but also to manufacture twice as much steel, and successfully to compete in some of the markets of the world, in which the Old Country has hitherto enjoyed a monopoly, it is mainly owing to the cheapness of fuel. It seems almost incredible but is nevertheless a fact that the 220,000,000 tons of bituminous coal produced in the States last year, only realized an average selling price at the mine of $1.02. The bulk of this coal was used in manufacturing industries and the result is a striking commentary upon the policy, which has been so steadfastly pursued by the Americans, in ensuring cheap fuel throughout the country. The highest price registered was in the western State of Montana where wages are comparatively high, and the lowest in western Virginia where there is a large element of black labour. Taking Pennsylvania as a representative State, with its 87,680,331 tons, we find that the average is only 94c.; comparing this with the selling price in Nova Scotia, there is a difference of about $1.30 ; and comparing the average selling price in British Columbia with that in Montana adjoining, there would be a difference of at least $1.50. We are not arguing that Canadian prices should be as low as American at any rate not at present It must he admitted that in the opening up of new industries the capital expenditure is heavier than at a later stage, and many difficulties have to be dealt with, having a tendency to raise the cost. But in Canada, as in the States, if we are to have successful manufacturing industries, we must aim at the goal of cheap fuel. To this end it behooves both capital and labour to be moderate and reasonable in their demands.

Whilst on the subject of American production of coal it may be interesting to note the enormous increase in the export of bituminous coal last year, reaching the considerable tonnage of 5,639,836, an increase over the previous year of nearly 2,000,000 tons. Of this 591,083 went to Europe, chiefly to France and the Mediterranean, against the insignificant figure of 23,272 the previous year. It is generally conceded that this large exportation to Europe was entirely due to the scarcity of coal prevailing at the moment, and that with the reductions that have already taken place in the price of Old Country coal, the market is reasserting itself. It looks more certain than ever, that Canadian coal only, can be advantageously exported to Europe.

Tbe increase in exportation of American coal to Canada during the year is very striking, reaching the considerable figure of 911,795. A least half of this would have been taken from Canadian mines, if it had been forthcoming, the other half could probably at present be delivered more cheaply over the Great Lakes than from any Canadian point of production, as it went mostly to Ontario, but it is not at all certain that these conditions will continue, and we are hopeful that the present year will see developments whereby Nova Scotia coal will find its way into Ontario.

The sudden fall in the price of iron and steel has directed attention to the prospects of the steel trade of Nova Scotia. and doubts have been expressed whether the anticipations indulged in as to tl.e future of that trade will be realized. It is reassuring to find that Mr. Moxham, the General Manager of the Dominion Iron and Steel Co., in a special report prepared for the President, and read at a recent meeting of the company, declared that he was perfectly satisfied that the anticipations that had been indulged in would be fully realized If so, the heavy shrinkage in prices will not appear so formidable as otherwise, the margin in favor of production at Sydney as against American works being considerable, and as this means a guaranteed market for Cape Breton coal, it is of the highest interest. A comparison of the prices ruling in the States during 1900 is very instructive. If we take four leading articles we find that in January Bessemer pig was selling at $25.00, in December at $13.90 ;

basic pig sold in January at $23.75, in December at $19.75 ; steel rails in January at $35.00 and in December at $26 00. Mr. Moxham's estimate of the cost of Cape Breton pig iron is $5.00, and of billets $10.00 to $11.00. It would therefore appear that there is still an ample margin, and that the superior position of Sydney for transportation purposes, must give the advantage in the markets of the world.

We have commented previously on the decreased tonnage of coal sent from British Columbia to Japan, due to the rapid development of the native industry. Just how enterprising and energetic the Japs have been, may be gathered from the fact that last year their production of coal exceeded 7,000,000 tons and their exports 2,000,000 tons. It is said that the average selling price f.o.b. is equal to $3.00 per ton ; if so, it cannot be denied that the Japs have found a good market, as although they have considerable engineering difficulties to overcome, especially in the large quantity of water found in their mines, labor is abundant and very cheap. Development of coal mining in Japan is once more directing attention to the splendid deposits of the Aleutian Islands, where coal, far superior to any yet found in Eastern Asia, has been mined on a limited scale for some years, the only market hitherto, with the exception ot a very limited local consumption, has been with trading vessels Only recently has it been possible to get a Government grant, but within the last year the American Government gave certain rights to a company, which has since been incorporated, and it is not unlikely that this coal will be developed for the Pacific trade. Although so far north the climate, especially on the southern shore of the islands, is mild, the great Japanese current keeping it free of ice. On the north side, however, Arctic conditions prevail. It is said that the coal has been tested and found satisfactory for steaming and domestic purposes.

Efforts are being made to interest the investing Canadian public in the coal deposit of Graham Island, one of the Queen Charlotte group. It is well known to geologists that this island has extensive deposits of most valuable coal measures, in the Cretaceous formation, and that all grades of coal, from anthracite to bituminous, have been found, including a high-class coking coal, said to be of the same quality as the Crow's Nest. As the outcrops are near the coast, there would be practically no transportation by rail, and water freight to any point on the Pacific would be much lower than from the Crow's Nest areas overland. The rate for coal from Fernie to Vancouver is $5.00, whilst from Graham Island it need not exceed $1.00. It is claimed by the owners that they can make a coke equal to the Crow's Nest, and can place it at the smelters in Everett and Tacoma for $5.00 per ton ; if so, they are assured of a good market, as that is the price of the Fernie coke at the ovens. We shall await with interest the development of this project.

The coal development work conducted by Mr. Cowan at Livingstone, near the entrance to the Crow's Nest Pass, has developed the existence of a seam 6 feet thick and of fair quality. A deep has been driven 600 feet at an angle of 65 degrees, but owing to the steep pitch and a large influx of water, work has been suspended for the present.

Application is being made to incorporate a company under the title of "The Southern Alberta Coal Co.," for the purpose of developing coal areas situated about 20 miles south-west of Lethbridge, between the St. Mary River and the foothills of the Rockies. Outcrops have been traced for four miles and the areas bonded. Samples have been brought east, and analyzed, and show a high-class coal containing 72 per cent. of fixed carbon, 8 per cent. of ash, and less than 1 per cent. of sulphur. The coal has been successfully tested for steam and smithing purposes, and arrangements are under progress for building a branch line from the C. P. R. at the first siding west of Lethbridge. The seams are so accessible that it is expected to obtain a reasonable output during the present year. The capital required is not large and most of it will be raised in the west.

DOMINION COAL CO.

The following are the official returns of this company's output and shipments during the year ended 31st December :—It is estimated that the output for the company's year ending the last day of February next will exceed over 2,000,000 tons. It is intended to increase this during the ensuing year very largely, as there will be two collieries producing greater quantities of coal than at present. It is not too much to expect that 2,500,000 tons will be mined in 1901.

	Output.	*Shipments.*
Dominion No. 1	538,237	
Dominion No. 2	610	
Dominion No. 3	68,831	
Dominion No. 4	25,428	1,831,637
Caledonia	511,874	
Reserve	632,056	
International	222,703	
	1,999,737	1,831,637

Disposals.

	Tons.
Nova Scotia	262,048
Prince Edward Island	15,902
Newfoundland	50,485
Quebec	653,987
New Brunswick	63,183
St. Pierre	5,799
United States	620,867
Bunker	159,366
Colliery Consumption	67,637
Company's Railway	13,438
Colliery Employees	24,258
	1,936,970

Recapitulation.

Shipped	1,829,199
Land Sales	2,438
Collieries and Railways	81,075
Employees	24,258
	1,936,970

ACADIA COAL COMPANY.

Output 1900.

	Tons.
Total Coal Raised	286,045
" " Sold	247,274
" Coke Made	18,637
" " Sold	18,624

Labor.

Employees above ground	269
" below "	579

Coal Disposals.

To Nova Scotia	142,352
" P. E. I.	24,301
" Quebec	31,888
" Ontario	2,842
" New Brunswick	18,937
" Colliery Employees	5,526
" Engines and Coke Ovens	60,012
	285,858

In the item of "Coal Sold" we do not include coal supplied for Employees or Engines.

NOVA SCOTIA STEEL COMPANY.

Coal Disposals.

	Tons.
Shipped	184,348
Intercolonial Railway use	5,429
Local Sales	27,753
Workmen at the colliery, etc	7,617
Coal gifts to widows, etc	405
Colliery use, fixed engines, locomotives, shops, etc	17,225
Sundries	3,394
Total coal raised	246,171

New works have been commenced during the autumn, the construction of some coke ovens and of a coal washing plant.

Some 10 or 12 new dwellings for workmen have been built.

The colliery has changed hands during the year, and is now the property of The Nova Scotia Steel Company, Limited, whose head office is at New Glasgow, Nova Scotia.

CUMBERLAND RAILWAY AND COAL COMPANY, LTD.

The coal sales of this company in 1900 amounted to 396,783¼ tons, distributed as under:—

Nova Scotia	118,328
New Brunswick	234,764½
Quebec	40,365
United States	3,325¾

CANADA COALS AND RAILWAY COMPANY.

New Brunswick		46,837
Nova Scotia		4,527
Quebec		8,629
Employees	1,340	9,487
Engines, etc.	8,147	
		69,480

INTERCOLONIAL COAL COMPANY.

Coal Disposals, 1900.

	Tons.
Total coal raised	241,310
" coke made	2,231
" " sold	2,623
Employees above ground	484
" below ground	155

Coal Disposals.

	Round.	*Slack.*	*Total.*
Nova Scotia	68,550	24,762	93,312
New Brunswick	20,070	3,566	23,636
P. E. Island	10,907	3,708	14,615
Quebec	65,351	20,807	86,158
St. Pierre	208	70	278
Coke ovens	....	4,209	4,209
Colliery employees	3,100	560	3,660
Colliery engines	4,786	10,097	14,883
	172,972	67,779	240,751

CAPE BRETON COAL MINING COMPANY.

Coal Disposals, 1900.

To	Tons.
Newfoundland	183
Nova Scotia	1,700
P.E. Island	5,767
New Brunswick	173
St. Pierre	327
Colliery consumption, Colliery employees	2,250
	12,500

The Gowrie and Blockhouse Collieries, Limited, shipped, we believe, about 20,000 tons. The Inverness-Richmond Collieries and Railway Company, Limited, are equipping their Broad Cove colliery with a thoroughly up-to-date plant and will add to the list of shippers during the present year. No figures received at date of going to press from the Port Hood or Sydney Coal Companies.

A Proposed New Method to Raise Coal, &c., in Shafts.

By W. S. GRESLEY, Mining Engineer. Erie. Penn., U.S.A.*

That there is room for improvement in winding machinery, especially for deep shafts and large short-shift outputs, is, I believe, allowed by all mining and mechanical engineers who are interested in the subject; and as mines get deeper and deeper, so does the difficulty of the winding problem become less easy of solution.

Engineers already are beginning to talk about dividing very deep shafts into two or more sections or heights, and so to increase the number of winding-engine units in or for them—to adopt *stage winding*, in fact. As my reading leads me think that this Institute is taking the lead in the discussion of winding matters, I (its only American member) think proper to send this Paper to *it*, rather than to one of the others to which I belong.

Now, it seems to me to be pretty generally admitted that in the case of the deepest and largest collieries the existing winding plants have a total horse-power something like as large again as would be needed to do the same work were it not for the *high speeds* at which the cages must travel in order to land the requisite tonnage in the time allowed for winding; in other words—is not the power developed in these large winding engines in starting the loaded cage and in getting up speed in the shaft 100 per cent. greater than would be the case were the winding performed slowly?

If we regard a winding engine, including ropes, cages, &c., as the *tool* used by the power-generating plant—the boilers (including water, fuel, &c.)—to lower and raise the trams and loads, it seems to me that if this tool or apparatus could be constructed and operated in some other way so that it would accomplish the same ends, but with a great saving in steam, a prospect of its adoption at the deeper shafts, yet to be sunk, would appear.

Since the scheme herein propounded is for slow-speed hoisting, one of two things must be done, namely—either the individual tram loads must be made much larger, or more loads—more trams—must travel in the shaft at the same time. It is of the second method or proposition that I have been trying to think out a practicable solution. I propose to do away with the winding engine—not to *wind* at all, but to elevate, or hoist the coal in trams or other convenient receptacle, without the employment of drum or rope.

This announcement may have a rather startling effect upon many of you, but when I go on to say that my idea is merely the adaptation

* From a paper read before South Wales Institute of Engineers.

of the principle embodied in the old piece of mine machinery called the "man engine," perhaps you will feel less uncomfortable. The man engine to which I refer is that type of same in which two reciprocating rods are employed. Now, if for the *men* riding up and down on this engine we put the word *trams* (loaded and empty, of course), you will, I think, at once "catch on" to my idea, which, of course, is this: that with two parallel rods working up and down slowly in a shaft (something like the two main pump rods of a large double **L**-bob pumping engine), at the ends of the strokes the trams shall change rods, and so the loads are caused to ascend while the empties descend.

This, then, would be *stage hoisting*, and yet closely approach *endless hoisting*. As there would be an equal number of trams riding on each rod or limb of the apparatus, and the rods and their platforms &c., being practically equal in weight, the thing would be balanced, and only the weight of mineral being hoisted, plus friction of the machine, would require the application of power. This, then, is the proposition in its simplest outline or aspect. The question is, Will it *work?*—will it be *safe?*—can the parts and the details of the outfit be so designed, constructed, operated and maintained that the thing, as a whole, will give satisfaction?

In order to make the *modus operandi* of the hoist more clear to you in detail, I would remark that, instead of using the word *rods*, I propose the word *carriers*, because I question if a single rod for each half of the hoist would be as suitable as, say, two parallel rods, conveniently connected together by cross-bars so as to form what may be regarded as a huge chain or ladder-like structure, between the rods and horizontal bars of which the floors (*cages*, if you prefer the word) to hold the trams would be carried.

Suppose, then, that each of two vertically reciprocating carriers be fitted with an equal number of tram-platforms, arranged vertically one above another at proper intervals so that a sufficient number of arrivals of them at surface per shift gave the desired output of coal; and further, let all of these platforms be arranged in pairs (*see* diagram A), *i.e.* constructed as 2-deck cages; then, since the two carriers will make their opposite-movement strokes simultaneously—commencing as well as ending the same exactly together (like the connected pump-rods referred to above)—at end of every stroke all of the platforms upon one carrier will be brought even with or level opposite to a like set of platforms upon the other carrier, excepting the platforms at the top and at the bottom of the shaft (*see* diagram A). Each deck of every double platform to be designed to hold one tram—the bottom decks are for the loads, the top ones for the empties. Only one deck of each double platform will be occupied whilst carriers are in motion, because during down strokes empties (occupying top decks) will be riding, and during up strokes loads (occupying bottom decks). Thus, aided by the diagram, showing the direction of travel of the two sets of tubes, the method of causing them to pass or dodge one enother in the shaft will be understood. It will be observed, then, that every time each carrier lowers an empty tram into the bottom, the opposite side carrier has raised a loaded one the length of the stroke, to a point or platform next above that in which the said empty reached the bottom. Likewise and simultaneously as each higher-up load is about to be lifted, empties, on the other carrier, are ready to drop a stroke's length. Of course at surface and in the pit bottom suitable running-off and running-on levels or stages would be arranged, fitted with proper "caging" appliances. It will also be evident that to enable the trams to change platforms at the ends of the strokes dead pauses, of sufficient duration must be provided.

If this "man-engine" action is feasible, there remains to be provided suitable, that is reliable, apparatus wherewith to make the trams move over from platform to platform at the proper times; also to hold them in position when carriers aro in motion, as well as mechanism for releasing them for transfer at end of every stroke. Automatic apparatus only can be thought of in this connection, for tilting-bottom cages would be unreliable, and men too expensive as well as uncertain for the job. The trams themselves, then, as long as it is expedient to bring up the coal in them, must run across from cage to cage on their own wheels, or else be carried, run, or slid over upon some kind of a floor. My scheme provides for the former method, and to accomplish this manœuvering of the trams in the shaft I have conceived simple mechanism whereby combined locking, pushing and releasing movements can be obtained. Every deck or platform would be provided with one of these pushers, the position of which would probably be

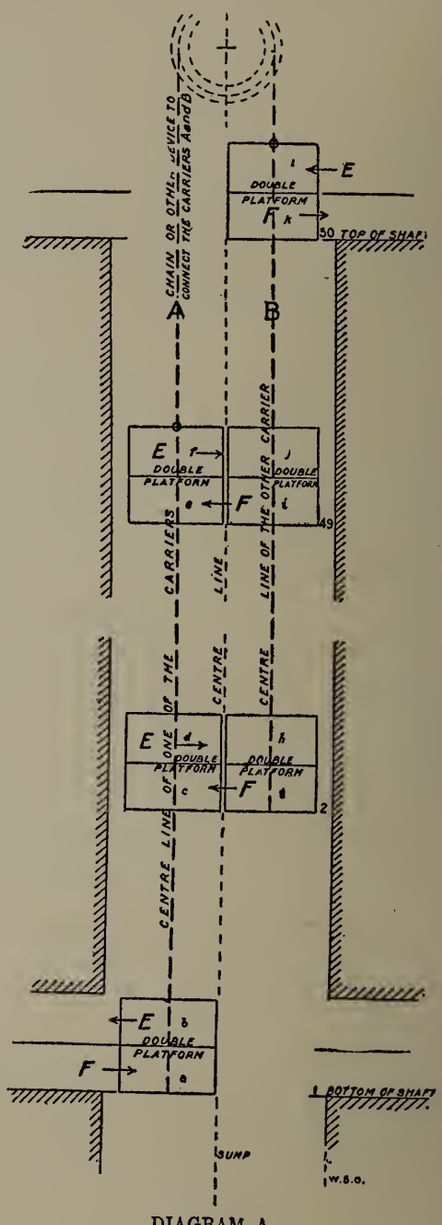


DIAGRAM A.

beneath the tram and about on a level with the rails or track. The pushers to be started by lever, arm or other contact made when the carrier comes to the end of its stroke. The motive power for these pushers to be compressed air or hydraulic pressure as found best. The Westinghouse Air Brake for railway trains furnishes an idea in this particular. To maintain a proper level or horizontality for the transfer of trams, adjusting screws on the carriers would be provided; likewise guide rods of suitable character for steadying cages or resisting the thrust when transferring—when the pushers are at work.

As to the design and construction of the carriers, the speed being

quite slow in comparison with cages and ropes, serious strains. jars, vibration and swag would be practically *nil*, so that a very low factor of safety could be used. Steel, of course, offers the best material for construction. The verticals or side rods might either be made taper, thickest or strongest at top, of course, or the carriers be built articulate, each section throughout hinged or pinned to the one above and below it, yet separately balanced; so that the entire length of the carrier would be practically uniform in quantity or weight of material of which it is composed. This plan might be the more scientific of the two, yet less feasible on account of the complications involved in balances. But these and other details are beside the question as here presented; of course, the plan can never be used unless the difficulties are overcome, and the working of the thing as a whole shall be as reliable as existing systems.

The lift or hoist proper, having been thus designed or conceived, their remains the all-important part of the outfit, to be called the motor or hoisting engine, for consideration. Presumably the strokes will be very long, the duration of the pauses some seven to ten seconds each, and the speed of the carriers, say, 6 feet or so per second. The horse-power will be found by the ordinary rules, when the tonnage is given. All things considered, direct-acting hydraulic pistons or rams, driven by high-class steam engines and pumps, with or without an accumulator, would seem to me to be about what is wanted; but this being more within the province of the mechanical engineer than the mining man to work out is not the burden of this Paper.

Obviously, the nature of the work to be done is that of a direct upward pull or push applied first to one carrier (ram or piston), then to the other—the power being transferred from the one to the other every few seconds. The scheme, then, *seems* to possess no feature that could not be controlled or operated automatically from the throttle of the main engine to the caging apparatus in the shaft bottom; moreover, it *seems* to point to economy in the matter of fuel, supplies, and wear and tear or maintenance as compared with the use of ponderous drum-winding machines and hurricane-speed cages, &c. I do not say anything about head gear for such an equipment—none, such as is now required would be needed. Overwinding could not occur. A modification of my ideas might evolve something practicable, if the scheme herein is to be pronounced impracticable.

THE ASBESTOS INDUSTRY.

Our correspondent at Thetford Mines writes under date of 18th instant: "The production of asbestos, which has increased to large dimensions in 1899 and 1900, gives unmistakable evidence that the ensuing year will be the greatest in the history of this most important Canadian industry. During the past year the output may be stated to have amounted to a little over 19,000 tons, and I should not be a bit surprised if it reaches 22,000 tons in 1901. The Johnson's Company, in addition to the old mill that they were running, have about completed a very large mill, which ought to give them a very much increased output. King Bros. are at present engaged in the erection of a very large mill in addition to the one already in use; this mill will be equipped with one of the most modern plants, which will largely increase their output for 1901; and just here I may add that their 1900 output was the largest they have ever had and amounted to something like 5 000 tons. The Bell's Company are making considerable additions to their plant in 1901 and their output will be considerably increased over 1900. The Beaver Asbestos Co's mine, which has been closed down for the past four years, has resumed operations and are now equipping their new mill with one of the finest plants that has ever been put up in the Thetford District. They expect to have their mill in operation about May 1st The mill building is about 150 x 60 feet, and is four and a-half stories high, all framed with 12-inch square timber. Mr. E. C. Bacon, of New York, is the engineer in connection with the work, and Mr. H J. Williams, resident manager, is looking after the construction. The engine and boiler plant in connection with the new mill will deliver about 550 h. p., and all machinery in connection with it will be built by the Jenckes Machine Co., of Sherbrooke, under the supervision of Mr. Bacon of New York. There is some talk also of opening up the Ward Ross property in the spring, which will no doubt add considerably to the output.

At Black Lake the Johnson's Company are erecting a very modern mill over what has proved to be one of the most successful mines ever operated in the district. The output of No. 1 is fully equal to that of any mine in the Thetford district for the last year and the quality of the material was fully equal to anything ever mined at Thetford. There is no doubt but that when the mill plant they are now working on is put up they will have a very large output from this mine also.

The Wertheim, or Union Mines, have added considerably to their plant and claim that they will make avery large increase over their 1900 out-put.

The Canadian Asbestos Co who have had a fairly large out-put for Black Lake for 1900 will no doubt increase their out put this year also and it is also expected that the Anglo-Canadian Co. will open up their property in the Spring. The demand for asbestos is so great that there is hardly a ton available anywhere and the indications are that the increased out-put will be nothing like the demand during the ensuing year. The business as a whole was never in such a flourishing condition as it is today and even with an advance of 25 per cent in wages, which was made in April 1900, labor is very scarce and from 200 to 300 more men could be employed immediately if they were available."

COMPANY NOTES.

St. Eugene Consolidated Mining Co.—At the annual meeting of shareholders held in November last the old board of directors was re-elected. The capacity of the company's concentrator has been increased to 400 tons per day. Shipments during the past few months have been at the rate of 2,700 tons per month. On 1st instant a dividend of three per cent. was paid and it is the intention of the directors to continue this quarterly. The following is the financial statement of the company for the ten months ended 30th September last :—

ASSETS.

Mines and mineral claims		$3,200,000 00
Cash in banks—		
Bank of Toronto, Rossland	$38,046 46	
Bank of Toronto, Toronto	289 93	38,336 39
American Smelting and Refining Co. (Due for ore shipped but not paid for)		94,717 85
Machinery, buildings and equipment—		
Compressor plant	15,226 47	
Boiler plant	6,382 32	
Concentrator plant	35,164 25	
Air line	8,879 09	
Yard facilities	1,430 57	
Tramways	10,105 41	
Machine drills and fittings	5,263 20	
Mine buildings	6,502 55	
Offices and sundry buildings	7,074 24	
Flumes	18,506 34	
Cars and rails	3,809 18	
Wagon roads	912 57	
Crown grants	380 25	119,636 44
Stores on hand		12,323 94
		$3,465,014 62

LIABILITIES.

Capital stock	$3,202,000 00
George Gooderham (advances and interest)	136,938 93
Amounts payable	1,166 66
Profit and Loss	124,909 03
	$3,465,014 62

PROFIT AND LOSS.

To Cost of mining and developing Company's properties, as follows :—			
Mine labor and supplies	$148,993 89		
Compressor labor	2,973 93		
Compressor supplies	3,398 81		
Machine drills and fittings	3,908 68		
Tramways expense	6,964 38		
Salaries	5,850 00		
Office expense	3,295 08		
Assay office expense	1,086 70		
Surveying	2,090 97		
Concentrator expense	12,675 99		
Sundry expense	3,020 54		
		$194,258 97	
" Amount written off for deprecation		14,662 27	
" Travelling expenses		245 00	
" Interest and exchange		5,769 21	
" Legal expense		2,172 49	
" Taxes		1,893 92	
" Insurance		756 00	
" Stock discount		1,000 00	
		$220,757 86	
" Balance		124,909 03	
		$345,666 89	
By Ore sales (9,043 tons) 5 months		343,736 47	
" Rents and sundries		1,930 42	
		$345,666 89	

Athabasca.—The capital stock is to be increased £10,000 for the purpose of acquiring the entire assets of the Exchequer Gold Mines Limited, owning the group of the same name on Morning Mountain, Nelson Div-

ision, B. C. The shareholders of the latter Company will receive the £10,000 in Athabasca stock in full payment for their assets. As the properties are adjoining they can under one management be worked more economically than heretofore. A tram will connect the Athabasca mill and the Exchequer properties. Work on the latter will be resumed immediately and development, now amounting to 750 feet of tunnels and 100 feet of shaft, will be vigorously prosecuted.

North Star.—This great silver-lead producer has shipped during the past year 17,500 tons of high grade ore, and promises to eclipse this record in 1901 for already the output is 2000 tons per month. Eighty-five men break down the ore, a clean galena, and it is delivered to the cars by a tram having a daily capacity of 200 tons. Dividends at the rate of 12 per cent per year are being paid, and besides this a large amount is being reserved and an equally large sum is being put back into the mine in development. The great trio—St. Eugene, Sullivan and North Star—will soon attract as much attention as the "Silvery Slocan."

Paradise.—This is the latest addition to that growing family—Canada's producing mines. This group in the Windermere Division, B. C., is a young mine, having been located in August, 1899, but already there is on the dump 100 tons of carbonate orr averaging $45 per ton in silver and lead. The vein is a contact between blue lime-stone and slate and in the lower workings averages 40 feet in width. Development consists of about 400 feet of work which will be greatly augmented this season. Depth on vein is now 100 feet but when the new tunnel and upraise are completed it will be 375 feet. The ore is brought out over a 4½ mile trail built by the owners of the group and a 12 mile Government wagon road to Golden; the cost is $7 85 per ton. There is said to be $100,000 worth of ore in sight.

Pittsburg Reduction.—This Company has just finished at Shawinigan Falls, Que., a plant for the reduction of aluminum from Canadian corundum. The plant cost $250,000 and will begin operations at once. It is the first of its kind in this country and the building of it is another evidence of the value of our corundum deposits.

Triune.—This celebrated Lardeau mine lately shipped 72½ net tons ore to the Trail Smelter which gave the following average returns per ton: Gold, .98 ozs.; Silver, 336.4 ozs.; Lead, 50½ per cent. The gross value of the shipment was $17,874 68 from which must be deducted Freight and Smelting charges, $1,600 30; Hauling $2,200; and Government Tax, $377.20, leaving irrespective of cost of mining and sacking, a net profit of $13,697.18, or $194.28 per ton. This is remarkable and speaks well for the quality of their ore, but it must not be thought this is the average value of ore in the mine. It was probably most carefully sorted—what else could be expected when transportation charges alone, to say nothing of cost of mining or smelting, amounts to $49.20 per ton?

Van Anda.—85 per cent of the capital stock has been acquired by John Lowles for himself and other English investors and on Feb. 1st. the management will be undertaken by Mr. Lowles' son, prominent in South African mining circles. The transaction means an expenditure of $500,000 besides whatever may be expended for future development and betterments. The Van Ada Copper & Gold Mining Company owned 25 mineral elaims, a townsite, smelter, tramway, &c, and had spent about $600,000 in development work, smelter construction, etc. It will require at least a like amount to open up the immense amount of ground covered by the claims involved and by that time (providing surface indications are found to be the outcrops of correspondingly large ore bodies under ground) with a smelter having a daily capacity of at least 100 a return may be expected. But with limited capital to make profits from these large low grade copper gold deposits was beyond hope. Now that men financially capable of doing the things, necessary have acquired the properties it is believed with reason that the Van Anda will in the course of a few years be a large and profitable producer.

Slough Creek (Limited.)—Registered on December 7 by Pakeman and Reed, 11 Ironmonger Lane, E.C., with a Capital of £200,000 in £1 shares. Object: To acquire the business of the Incorporated Exploration Company of British Columbia (Limited), to adopt an agreement with the said company and its liquidator, and to carry on the buisiness of miners, mineral and ore workers, and merchants, explorers, dealers in precious metals and stones, financiers, contractors, engineers, &c.: to acquire any mines, mining rights, metalliferous land, alluvial ground, and other property in any part of the world, to develope deal with, work, and turn to account the same in such manner as the company shall see fit. The number of directors is to be not less than two nor more than five, the first are to be appointed by the subscribers. Qualification, £250. Remuneration, Chairman £12 10s. per month, ordinary directors, £8 6s. 8d. per month, to be increased according to profits. Registered office, 58 New Broad Street, London, E.C.

British Columbia Minerals (Limited.)—Registered December 12, (capital £10,000 in £1 shares) to acquire the Lahore Mine at Nicola Lake in the Kamloops Division of the Yale District of British Columbia, and to carry on the business of miners, smelters, engineers, &c. Registered office, 2 Copthall Buildings, London, E.C.

Nimrod Syndicate.—The Manager of the Atlin Mining Co., Limited, under date November 24th, sends the following report to the directors of this syndicate of work done on McKee Creek, Atlin, during his visit to England:—

"Found the gravel on 20 below Discovery good, estimated to run from $3 to $4 per yard.

"Found rich gravel on benches on left-hand side of Discovery claim.

"Fonnd rich gravel on benches above Discovery fully as rich as in creek bed.

"Found richer gravel in creek on Discovery claim than any that has been previously worked.

"Found good pay on bedrock on all the ground that has been worked over, the bedrock not having been properly cleaned by the placer miners.

"I believe there is as much gold yet on the ground that has been worked over as what has been taken out.

"Staked fourteen bench claims, eight below and six above Discovery, and found good prospects on nearly every one of them.

"Believe some of the benches above Discovery richer than anything that has been worked in the creek."

The Highland.—The Hihland Mine at Ainsworth is now shipping ore after only five months' work. A test shipment of 100 tons has been now sent to the Hall Mines smelter, Nelson. The company has already expended no less than $150,000 in purchase, development and plant. The property is a silver-lead proposition, the ore carrying an unusually high percentage of lead. Its management estimates that the clean ore and concentrates will run 62.5 per cent. in lead, and 30 ozs. in silver. The company has recently purchased the Kootenay claim, and has staked out other property, forming a continuous line from their outside claims to the shore of the lake. The principal vein on the group is a ledge 8 to 10 ft. wide, and carrying several shoots of clean ore, the balance being concentrating. The vein is developed by three tunnels at distances of 100 ft. apart vertically and connected by upraises. Of these, the middle or No. 2 tunnel, is on the vein for a distance of 800 to 900 ft., the No. 1 tunnel has been driven in ore throughout, and the No. 3 tunnel which was recently staked has cut the vein also. Outside the lower tunnel are the ore bins, with a capacity of 400 tons, and bunk-houses, offices, &c., for the accommodation of men. An aerial tramway 4,600 ft. long connects the ore bins with the mills. A second ledge parallels the principal vein at 250 ft. west. It has been opened in two places showing clean ore, but the present owners have not developed the vein yet. On the Kootenay claim is a third parallel vein opened out by the former owners. The concentrator is progressing to completion and is expected to be in operation by the middle of this month. It will have a capacity of 100 tons daily. Power is obtained from Cedar Creek, a flume delivering 200 miner's inches of water under a head of 450 ft. on four Pelton wheels. Near by are bunk-houses, an assay office, and other buildings. A self-acting incline leads from the mill to the wharf, and the company estimates the cost of putting the ore on board the barges at the low figure of 20 cents a ton. On the lake front a permanent wharf and floating ship have been built. The company expects to employ from 50 to 60 men from now on, and to ship from 500 to 900 tons of clean ore and concentrates per month. A contract has been closed with the Hall Mines smelter to handle a part of the output.

Rock Lake Mining Company.—The development of this company's property is being actively prosecuted. The Rock Lake mine is situated about 12 miles north of Bruce Mines, Ontario, the holdings of the company comprising the n. half of lot 2, concession 6 of Plummer, the n. half of lot 3, same concession, s. half each of lots 2 and 6, and all of lots 3, 4 and 5, concession 1 of Coffin, district of Algoma. The corporation has the title the Rock Lake Mining Co., Limited, with the following officers: President, M. Wile, Buffalo; secretary, L. C. Holden, Sault Ste. Marie, Mich.; treasurer, B. C. Coryell, Chesaning, Mich.; general manager, Arthur S. Burrows, Bruce Mines, Ont. The ore consists of chalcopyrite, desseminated through a quartz gangue with hackly fracture, occurring in diorite, with a wall rock of altered diorite, having a resemblance to slaty structure. The trend of the lode is approximately w.n.w., bearing in the direction of a dike of dark eruptive rock apparently but little less acid than the diorite, through which it was intruded. An up-to-date plant is being installed.

Canadian Gold Fields, Limited.—This company, under the able management of Mr. P. Kirkegaard, continues to successfully exploit the old Deloro mines in Hastings County, Ontario. The milling and mining plant having been fully described in a previous issue of THE REVIEW, the following notes on the treatment of the concentrates will be of interest:—The concentrates after treatment by bromo cyaniding are dried, and then roasted in a revolving cylinder roaster. The fumes are condensed in a serious of brick chambers with vertical baffle-walls. The fumes are collected from the condensing chambers and refined by re-roasting in a special form of reverberatory furnace, the fumes being condensed in a second set of brick chambers. Separate, securely sealed rooms are set apart respectively for bolting the arsenic and for packing. The arsenic is packed in kegs by the aid of an automatic jumper, and all kegs are plainly labelled and cleaned for shipment. A double wash-room is provided for the workmen, one part for clean clothes and the other for the clothing to be worn in the works.

Granby Consolidated Mining and Smelting Company.—Mr. A. B. W. Hodges, superintendent of the smelter at Grand Forks, B.C., reports the operations last year as follows:—"Our first furnace started on August 21st, and during that month smelted 2,902 tons; during September one furnace smelted 8,753 tons, and on the 13th of October the second furnace was blown in, and the smelting total for that month was 14,215 tons; November, two furnaces smelted 18,050 tons; December, two furnaces smelted 18,467 tons; making the total smelted for 1900 of 62,387 tons. The total output of matte for that period was 2,200 tons. This matte averaged about 51½ per cent. copper, and of course contained gold and silver values. All this ore came mostly from the Ironsides, Knob Hill and Victoria claims. We have smelted about 4,000 tons of outside ores during this period."

British Columbia Copper Company.—At this company's smelter considerable progress has lately been made. Practically all the plant and machinery were received before Christmas, excepting the engine for the stamping mill. The main engines, boilers, blowers and the electric light plant are all installed, and water and blast pipe connections with the furnace are made. The sampling machinery is being put in. There are about 5,000 tons of ore in the bins, and more is coming down from the company's Mother Lode Mine regularly. Coke will arrive shortly. Other preparations for blowing in the furnace are well forward, so that the starting will not be long delayed.

Standard Pyritic Smelting Company.—The buildings for this smelter are finished, the furnace is being erected, sampling machinery installed and railway connections made. The beginning of February is given as the time smelting operations will start.

Port Hood Coal Company.—Mr. John Johnstone, for many years identified with active coal mining in Nova Scotia, and for several assistant to the manager of the Dominion Coal Company, has been appointed

manager of this company's colliery at Port Hood, C.B. Preparations will at once be set on foot for the erection of a bank-head capable of handling a thousand tons a day. The bank head will have fixed screens, and will be so constructed that picking tables may be added at a future time if needed. The angle of the seam being fairly steep, the ordinary system of slope haulage will be employed. Eight fifteen to twenty hundred weight boxes will constitute a rake. A pair of 20 x 42 inch cylinder hoisting engines have been ordered; as has also a pair of Babcock and Wilcox boilers each of 250 h.p. There will be a pair of hoisting 7 feet drums capable of winding a mile of 1 inch wire rope. A fan of high capacity, capable of producing 200,000 feet of air per minute will be supplied by the Dickson people of Scranton, Pa. The winding and fan engines will be built by Messrs. I. Matheson & Co., of New Glasgow. It is proposed for the present to order one side of a duplex compressor for mining and pumping. If mining machinery proves a success, the other side of a compressor will be ordered and thereby sufficient power obtained for mining all coal by machinery It is Mr. Johnstone's intention to at once proceed with all foundation work, so that when the machinery comes to be delivered in April all parts can be placed in position on their final resting beds. The main slope is now down 1,100 feet, and sinking will continue In preparation for early summer shipments levels will be driven by machinery, starting in the slope at a distance from the surface of 1,000 feet. This will allow balances to be driven up at least 350 or 400 feet long, and still leave a sufficient barrier between the new and the old workings. The mine will be worked on the bord and pillar system. Coal will be shipped during the greater part of each yerr from a substantial wharf 1,400 feet long now in course of construction, and which it is intended to finish during the winter on the ice. At the end of this wharf the depth of water will be thirty feet. In winter time shipments may be made over the Inverness and Richmond Railway at Port Hastings, or it may be that, by and bye, a winter port may be found at Caribou. The coal from the mine to the pier, about a mile, will be carried by aerial tramway. This mode of transit is bound to become popular, as it saves a large amount of superstructure The coal will fall from the screens into the tram buckets. The power at present at the colliery is sufficient for an output of 150 tons per day; and will be ample until the heavy machinery is in place. From what is known of the new manager it goes without saying it that all work will be done efficiently and expeditiously and that the new mine will be among the large producers in the near future.

British Columbia Chartered Company.—Drifting and crosscutting on the 450-foot level of the B.C. mine, Summit camp, is now in progress. Between the first and second levels the ore body is 65 feet wide and 460 feet long, and at the third level it is 40 feet wide, but contains higher values. Last week's shipments were 1,000 tons.

Gowrie and Bockhouse Collieries, Limited.—Our illustrations this month include three photos of the new colliery opened at Port Morien, Cape Breton, by this company. An excellent plant has been installed. Loading pier No. 1 recently finished; height from water to summit 46 feet; capacity of bins or pockets 400 tons; pockets divided into four compartments, each with separate tip or coal chute for vessel's hatch. By means of these pockets vessels are loaded as fast as trimmers can handle coal in the vessel's hold. The pier is isolated from, but connected with the colliery, 1,400 ft. distant, by steel cable, operated on the endless haulage principal, with this difference, that the cables both haul and carry the coal in ½-ton carriers to the pier. The coal slides off the screens at the pit-head into these carriers, and then passes to the storage bins at the pier The cable plant has been furnished by the Ropeway's Syndicate, Limited, (Roe & Bedlington's Patent), and has a capacity of 1,000 tons per day. Pier No. 2, for ocean steamships, is now under construction, with a designed capacity of 2,000 tons. 106 persons were employed at this colliery last year.

Inverness-Richmond Collieries and Railway Company, Limited.—The opening up of this company's valuable colliery at Broad Cove is being pushed rapidly forward under the supervision of Mr. Charles Fergie, the company's consulting engineer. A complete plant will be installed in the spring.

Brookfield Mining Co.—Since this well-known Nova Scotia gold property was acquired by its present owners 52,075 tons have been extracted and the total value of the gold yield has been $430,464. The returns for 1900 were 3,083 oz. 2dwt 13 grs from 8 989 tons of rock milled.

Sydney Coal Co.—This Company's output was increased to about 9,000 tons last year. As the workings go to the deep the coal improves, the seam now averaging 4 ft. 6 inches.

Mines Exploration.—This is a new syndicate, incorporated in B. C. to acquire from Mahon, McFarland and Mahon, Ltd., options or bonds on the "Lorne", "Woodchuck" and "Sure Winner" Claims, on Cadwalladar Creek, a tributary of Bridge River, Lillooet district, B C. The directors are:—Leslie Hill, J W. McFarland and Edward Mahon, Vancouver; Arthur N. Pelly, Greenwood, B. C.; and Claud R. Watson, Vancouver. The authorized Capital is $150,000 in shares of $1 each· The development of the properties is proceeding and the results so far are reported to be encouraging.

Ottawa Gold Mining and Milling Co.—The Secretary reports the following bullion returns from the Sakoose Mine, Lake of the Woods:—

	Tons Crushed.	Value.	Bullion.
1st. December	293	9.65	$2,831.63
15th December	207	10.56	2,194.64
3rd. January	189	9.31	3,185.95
21st. January	236	7.83	1,848.72
		Total,	$10,060 98

The last brick is some $2.00 per ton lower than usual owing to the crushings having been taken from low grade material mined in development work. The crushing capacity at the company's Keewatin mill has been increased to 20 stamps on this ore and returns in the future are expected to be larger.

MONTREAL-LONDON.

ANNUAL GENERAL MEETING 8TH JANUARY, 1901.

The Fourth Annual Meeting of the Shareholders of the Montreal-London Gold and Silver Development Company was held at the Mechanics Hall, Long Room, 204 St. James Street, Montreal, at 11 A.M.

The President, Wm. Strachan, called the meeting to order and the Secretary read the notice calling the meeting.

The Minutes of the third Annual General Meeting were read and approved.

The following report and statements were read and submitted:

In submitting the Financial Statement for the past ten and a half months your Directors beg to briefly report what has been done during that time:

The management of the Company's properties (The Dufferin and Lake Eagle Mines in Nova Scotia) was, until last May, in the hands of Mr. E. A. Daly, mining engineer, who succeeded Mr. B. MacDonald the former manager. From then till the 15th of this month, Mr. L. W. Getchell, mining engineer, has acted as manager, part of the time for Captain James G. Miller (under the option presently to be mentioned) and thereafter on behalf of the Company.

In May last, Captain Miller was given an option to purchase the said properties, in accordance with a memorandum of agreement, a copy of which was embodied in the circular of June 21st, 1900, which was sent to the Shareholders. This option, however, has not been exercised; Captain Miller having fallen sick and failed to carry out his obligations, and especially that of erecting a plant to treat the concentrates and tailings, and the Company having refused to give him an extention of time or to modify the agreement. The properties were accordingly, on the 15th day of August, 1900, handed back to the Company, and Captain Miller's mining engineer, Mr. Getchell, retained as manager.

You were informed of the above by the circular of November 24th, 1900, which also contained a copy of Mr. Getchell's report upon the Mines. In this report, you will remember, Mr. Getchell perdicts that with proper treatment of the concentrates and tailings the Dufferin Mine can be made to yield from $100,000 to $120,000 a year profit. In this his expectations are the same as those of all the Mining Engineers who have had occasion to examine and report upon the property.

As the tailings and concentrates cannot be treated without the installation of a cyanide plant, and as the money for such plant and for the payment of the floating debts and other expenses could not be procured from the Company's present resources without sacrificing valuable assets, your Directors deemed it advisable that Preferred shares should be issued to an amount of $150,000 on the terms and conditions embodied in the last mentioned circular.

In order that no risk be incurred in the installing of the cyanide plant, your Board are now having complete and exhaustive test made of both the concentrates and tailings. In the meantime, and pending the carrying out of the necessary financial arrangements, work at the mine has been suspended except in so far as required to keep the mine dry, fully protect the machinery and to accumulate fuel for future operations.

In the accompanying statement there will be found an amount of $157,363 as the estimated value or cost price of Stock Holdings and Concentrates. The Board desires to call attention to the fact that the Slocan Sovereign shares have been kept at the same valuation as last year viz: 35 cents.

As will be seen from the financial statement submitted herewith the capitalization of the Company is small compared with that of other Companies and if the expectations as to the value of its assets and especially as to the value of the Dufferin Mine are at all realized, the stock of the Company should ultimately prove valuable.

STATEMENT.—ASSETS AND LIABILITIES, ENDING 18TH DECEMBER 1900.

ASSETS.

Dufferin Mines:		
Cost ending 31 Jan. last	$417,664.87	
New Development during 1900	23,725.49	
		$441,390.36
Silver Queen Mine		78,126.00
Klondike expedition and Property		31,601.82
		$551,118.18
Stock Holdings and Concentrates:—		
Estimated value or cost price	$157,363.00	
Bullion Gold Mining Co., 50000 shares		
" " " No. 2. 50000 "		
Champion Gold Mining Co. 50000 "		
Slocan Sovereign Mines Co. 250580 "		
Mountain Lion G. Mg. Co. 25000 "		
Black Tail Gold Mg. Co. 18000 "		
Master Jack Gold Mg. Co. 100000 "		
Concentrates of an estimated nett value $24,000.00 to $30,000.00.		
Supplies on hand:		
At Dufferin Mines	$9,229.03	
" Dufferin Genl. Store	3,967.41	
		13,196.44

Accounts receivable	7,174.38	
Office Furniture	472.66	
	$178,206.48	
Cash on hand	2,321.26	180,527.74
		$731,645.92

LIABILITIES.

Stock Holders:		
1,948,975 Shares at 24c. each		$467,754.00
Bills Payable:		
Discounts and Current acceptances		86,812.07
Underwriters' Account:		
Advanced payments on ac. Preferred Stock		41,948.20
Atcounts due by Montreal-London,		
For ac. Dufferin Mines	1,589.84	
" Dufferin General Store	1,932.94	
" Montreal office	2,024.25	5,547.03
		$602,061.30
Balance Represented:		
by Profit and Loss Acct	99,584.62	
and Contingent Acct	30,000.00	129,584.62
		$731,645.92

STATEMENT.—PROFIT AND LOSS ACCOUNT, ENDING 18TH DECEMBER, 1900.

CREDIT.

1900.			
Jan. 31.	By Balance carried forward from last Annual Meeting		$146,180.09
Dec. 18.	" Amounts credited since:		
	" Prem. on 148,975 shares stock	$5,199.40	
	" Profit on Black Tail stock, sold 27,000 Shares	1,277.07	
	" Bullion Gold Mining Company Dividend No. 3	500.00	
	" Transfer Fees During 1900	263.32	
	" Gold bullion returns from Mint Acct. Dufferin Mines	27,937.72	
	" Bullion Gold Mining Co. Stock Bonus: Bullion Gold Mining Co., No. 2 50,000 shares est'd 25c. each	12,500.00	
	" Champion Gold Mining Co. 50,000 shares, est'd 25c. each	12,500.00	60,177.51
			$206,357.60

DEBIT.

1900.			
Dec. 18.	To Amounts charged for Management and Expenses:		
	Gen. Expense Acct	$5,441.37	
	Interest Account	5,598.65	
	Legal Exp. 3½ years	4,799.39	
	Option,—Tamarack Group Forfeited	605.00	$16,444.41
	" Dividends p'd to shareholders ending 15th August last		47,927.89
	" Contingent Acct.—Additional placed to credit for 1900		5,000.00
	" Dufferin and Lake Eagle Mines expenditure for 1900		37,400.68
			$106,772.98
	Balance at credit		99,584.62
			$206,357.60

On the above report and financial statements being submitted to the meeting DR. L. H. DAVIDSON expressed the opinion that the issueing of preferred stock as suggested by the Board would practically destroy the common stock, and that no action should be taken in the matter until the fullest information had been given to the shareholders.

The President Mr. Wm. Strachan and Messrs. F. L. Béique, David Morrice, R. Wilson-Smith, D. B. Mclennan and Robert Jaffray expressed their willingness to give to the shareholders all the information they possessed, and claimed that the issue of preferred stock was the only way to save the property and protect the interest of all parties concerned. They stated that their individual holdings In the company were very large (the holdings of the members of the board representing nearly ⅓ of the whole stock issued) and that they had not lost faith in the Dufferin property. To prevent the assets of the company being sacrificed by realizing at a time when all mining securities were depressed, and to provide for a cyanide plant &c., it was imperative that the preferred stock be issued.

Attention was called to the following figures: Par value of stock issued to date $467,754 out of which $78,126 was issued in payment of the "Silver Queen. There was paid to the shareholders in dividends to date $117,126. The Dufferin and Lake Eagle properties, including mining and development work to date, represent an expenditure of $441,590. There has been recovered in bullion $54,121 and in concentrates an approximate net value of from $24,000 to $30,000. Besides this, the company has realized a large amount of profits by the purchase and sale of other properties and securities.

The president explained that the reason why so much capital had been expended on the Dufferin property, was owing to the reports of the best mining engineers and experts, who led the Directors to look for much better results than were realized. The Company had consequently expected to mine 200 tons per day at $8.00 per ton giving $1600 per day, from which deducting $300 the estimated daily expenses would have left a yearly profit of $432,000. The Directors felt great disappointment at the result having fallen very far short of expectations, However, the best of mining engineers still adher to the belief that when the mine is properly worked and the gold extracted from the tailings and concentrates by the proposed cyanide plant to cost about $13,000, and by the use of a water power ($30,000), it can be made a most valuable property. By the new cyanide process, a large quantity of concentrates already mined can be at once advantageously treated and by the use of water-power instead of steam, an unusual saving of about $36,000 can be effected. The large acreage of the property, and the fact that some $800,000 of gold was extracted by the old company from a very small area, is most reassuring.

Enquiries were made by some of the Shareholders as to whether the delay to subscribe for preferred shares could not be extended.

The President answered in the affirmative and several of the Directors expressed their willingness to rednce their subscription to said Preferred shares so as to allow each Shareholder choosing to do so to have his *pro rata* proportion of the Preferred stock and thereby fully protect his common stock.

Mr. Isaac Waterman expressed implicit confidence in the Directors. They constitute one of the strongest boards that can be found; they had never taken any renumeration, and had done the best they could under the circumstances. He therefore moved, seconded by Mr. E. H. Copland—"That this meeting approves of the issuing of Preferred stock to the amount of One hundred and Fifty Thousand Dollars, as recommended by the Board; the time for the Shareholders to take their *pro rata* proportion of the Preferred stock to be extended to the first of March next."

While the votes were being taken and the proxies handed in, the old Board were unanimously re-elected as Directors for the ensuing year, and reported as thus elected by Messrs. A. C. Cumming and W. A. Magor as scrutineers, namely:

WM. STRACHAN, ESQ.	T. G. RODDICK, M. D.
HON. A. A. THIBAUDEAU.	CLARENCE J. MCQUAIG, ESQ.
S. H. EWING, ESQ.	ROBERT JAFFRAY, ESQ.
R. WILSON-SMITH, ESQ.	D. R. MACLENNAN, Q. C.
DAVID MORRICE, ESQ.	ROBERT BICKERDIKE, ESQ.
F. L. BEIQUE, Q. C.	J. P. DAWES, ESQ.

Pending the votes being counted, the meeting was then adjourned to the Company's office at 4:30 p. m. same day.

At 4:30 p. m. the meeting was resumed.

Were present:—The President representing self and a large number of Shareholders as per proxies filed and remaining of record, and Messrs. F. L. Béique, Isaac Waterman, and Deblois Thibaudeau.

The President announced that Dr. L. H. Davidson, representing 6365 shares, voted against the above mentioned resolution of Messrs. Waterman and Copeland, and all the other shareholders present or represented and forming a total of 1,159,154 shares voted in favour of said resolution—the whole as per list A and B, signed by the President and the Secretary-Treasurer, and remaining of record as forming part of the minutes of the meeting. The motion was therefore declared carried by a large majority.

On motion of Mr. Isaac Waterman, seconded by Mr. Deblois Thibaudeau, the meeting was then adjourned to Wednesday, the 16th January, 1901, at 11 o'clock, at the Company's office.

At the Adjourned Meeting of the Shareholders held at the office, 180 St. James Street, Montreal, on the 16th January, 1901, at 11 a. m., the Secretary reported that the shareholders present or represented 1,350,914 shares, the same being in excess of the required number of shares.

RESOLVED, UNANIMOUSLY—"That this Meeting again approves of the issueing of Preferred Stock to an amount of 150,000 (625,000 shares) on the following conditions:

(a) "The said Preferred Shares shall be entitled to cumultative dividends at the rate of ten per cent. per annum payable semi-annually.

(b) "The Company shall be entitled to redeem said Preferred Shares, or any portion thereof, at any time before the expiration of twelve months from the date of issue at a premium of five per cent. and accrued dividend and at any time thereafter at a premium of ten per cent. and accrued dividend.

(c) "The said Preferred Shares shall be payable at par, as follows: Four cents per Share on the first day of March 1901; Five cents per Share on the first day of April, 1901; Five cents per Share on the first day of May, 1901; Five cents per Share on the first day of June, 1901; Five cents per Share on the first day of July, 1901.

(d) "A discount at the rate of six per cent. per annum will be allowed on payments in advance.

(e) "That the nominal Capital Stock of the Company be accordingly increased by 625,000 shares, to wit: from 5,000,000 shares to 5,625,000 shares the said 625,000 shares to constitute the said Preferred Stock."

Moved by Mr. D. Morrice, and seconded by Mr. S. H. Ewing, "That the meeting adjourn to the Company's office on the 15th February next, at 11 a. m.' Carried.

RAINY RIVER DISTRICT.

Mining news is rather scarce at this juncture. There is talk of the re-opening of several of the prospects that had been shut down, but no more has yet been made. There is one notable exception, however, in The Stella. Work is to be resumed in two shafts—the one on the Stella vein, and the one on the large vein near the contact. The Stella shaft is down 127 eet, and it is to be put down another 100 feet. The shaft on the large contact vein, carrying much sulphide, is to be continued to 100 feet, and then a crosscut made to both walls; this shaft is already 60 feet deep. It is considered that this work will prove up these two veins, and show whether they are worth anything or not.

This revival of operations at The Stella is due to the exertions of Neil Campbell, Esq.—one of the original discoverers of the veins—who has just returned to Rat Portage from a visit to St. Paul, Minn., where he secured the capital for this work.

Mr. Campbell put through another deal on the same trip. This is on the Sundbla property on the north side of Black Sturgeon Lake, opposite Black Sturgeon mine. This property was located last spring. On the locations there is a wide and well-defined quartz vein, and on this a shaft will be sunk 100 feet, and the vein cross-cut to both walls. An outfit of tools and supplies has already gone out to the place.

Eagle Lake.—At Prendible Island, the Eagle Lake Mining Co.—Mr. N. B. Higbe, of Rat Portage, Manager—the shaft is down 60 feet, and are drifting both ways at the 50 foot level; one drift was in 40 feet a month ago. There is a very fine vein, four feet wide, three feet being good panning quartz.

Messrs. Curran and Stevenson have been developing their claim, which they have named The Vicking. They have sunk three pits to a depth of 15 feet. The vein is about 15 feet wide, and the rock is said to pan very well. They will continue sinking in order to get out enough ore for a test on a large scale.

Baden Powell.—This is owned by Messrs. Farneri and Partington, of Rat Portage, who are carrying on development work. Recently they uncovered in their explorations a new vein, as rich as the one first discovered.

The Manhattan Gold Mining Co. will begin development with the opening of spring. It is said to be their intention to put a boat on the lake for their own transportation work.

The veteran prospector, Ralph McKinstry, is reported to have made a deal on one of his claims with some St. Paul parties.

RAT PORTAGE, Jan. 19, 1901. J. M.

Box Car Loaders.

A new advertisement appears in this issue, and in fact, it is an advertisement of something new in machinery in the Canadian coal fields at least. We refer to the Ottumwa Box Car Loader, manufactured by the Ottumwa Box Car Loader Co., of Ottumwa, Ia., U.S.A. There are probably no coal fields of the world where any larger proportion of the product is loaded into box cars than the fields reached by THE REVIEW. All coal mining managers are familiar with the great cost that is added to the production of coal for the loading of it into box cars. Also, that the loss by reason of the mashing and breaking of the coal in the centre of box cars is considerable. It is claimed by the manufacturers of this loader that these two serious objections are largely overcome by the use of this machine, and that they can load box cars at about the same cost as for loading open cars, and with no more breakage to the coal. This should certainly prove to be a valuable invention, and the machine will probably come into great demand in this country. Patents have been taken out in Canada, and we will be pleased to see our mining men giving this investigation. While the machine was originally designed for loading coal, it is equally adapted for loading almost any material into box cars that requires to be shoveled from the centre to the ends of the car.

MISCELLANEOUS.

Quebec Central Mineral Shipments, 1900.—We are indebted to Mr. J. H. Walsh, General Passenger Agent of the Quebec Central Railway for the following figures of minerals carried over his line last year:—

Brick	6,811 tons.
Lime	8,236 "
Flag Stone	1,325 "
Chrome Ore	2,336 "
Asbestos	19,076 "
Granite	1,232 "

Diamond Drills for Nova Scotia Government.—The Government of Nova Scotia has, we understand, ordered another Diamond Drill for the purpose of exploring mineral areas in that progressive province. That there are very many valuable territories which are as yet unknown from the standpoint of mineral development, is well known to all persons who have been connected with this branch of provincial enterprise, and the fact that the Government is endeavoring to help along the progress of systematic examination of these grounds we think is most encouraging. This will make third the drill owned by the province and within a few months we may expect to hear of some valuable results of the boring operations to be undertaken in various sections of the province. We are told that the demand for the loan of these machines is so great as to make it a difficult matter for the mines department to allot their use in a satisfactory manner.

Calcium Carbide in Metallurgy.—At the Paris Exhibition, Siemens and Halske showed some specimens of metals, notably copper, reduced from their oxides by the aid of calcium carbide. Experiments in this direction had been made by Moissan, Warren, and others, and Goldschmidt had pointed out that the carbide could replace his powdered aluminium in the thermit reductions. In all these cases oxides appear chiefly to have been thought of. B. Neumann has now found that the other compounds might be started with, though so far the oxides seem to be the most promising. The experiment can be conducted in a test tube. Copper oxide and calcium carbide, both powdered, are mixed and heated over a Bunsen burner. The

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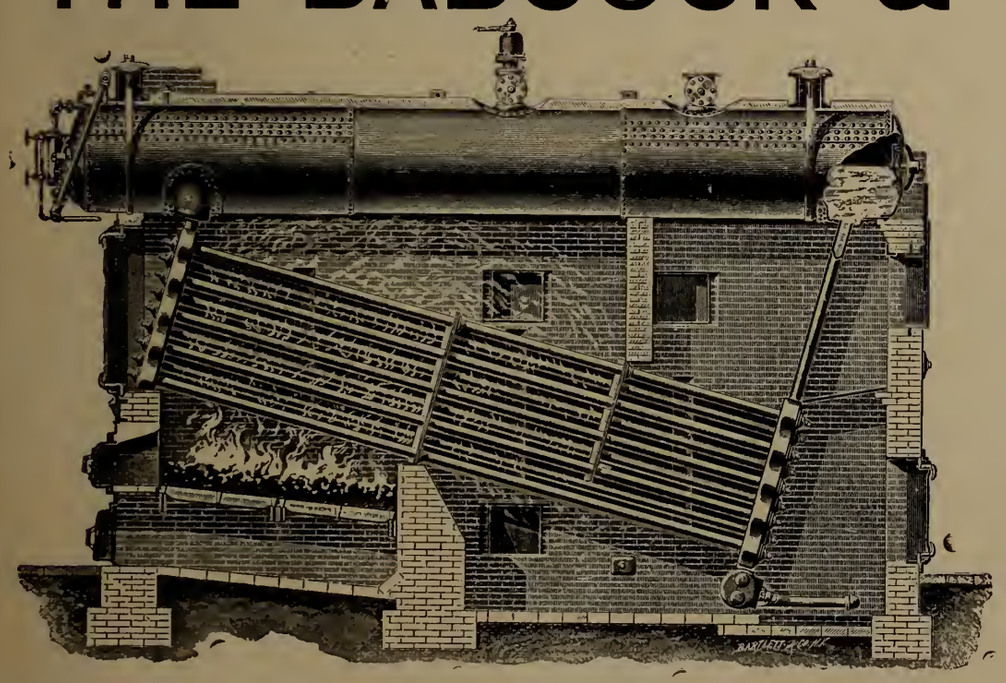

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mass will soon begin to glow. Sometimes the re-action is energetic enough to produce a copper mirror by volatilisation. But the heat does not suffice to unite the grains of metallic copper, mixed with carbon particles, by fusion. Even in clay crucibles only small reguli are obtained. The addition of a flux, borax, or common salt, facilitates matters somewhat, especially in the preparation of alloys from mixtures of the respective oxides. But Neumann did not achieve much with iron, chromium, and manganese. Chlorides may be used; but they must be free of water, lest acetylene generation cause explosions; the complete drying of metallic chlorides is, however, both troublesome and costly. Sulphates answer in the case of nickel and lead; as a rule, the metallic particles will not unite. Carbonates are also troublesome, but copper (malachite) and lead (white lead) give good results. Water glass makes a good flux, and success has been obtained with some metallic silicates. This last observation is encouraging; on the whole, however, the researches do not so far seem to be of any practical value, and most of the melallic impurities would re-appear in the product.

Graphite.—This mineral, which is now so much in request as a lubricator of machinery, is one of the most valuable products of Bavaria, and like the lithographic stone, represents almost a monopoly for the country, as the only formidable competitor in the supply of natural graphite is the island of Ceylon. The production of graphite in Ceylon has, however, diminished from 30,000 tons to from 12,000 to 15,000 tons annually, causing a great rise in prices, as the deficit could not be made good from other sources. The price of Ceylon graphite ranges from £50 to £75 per ton. In Bavaria the graphite deposits are found near Passau, and are inferior to the Ceylon graphite, as while the latter is nearly pure, the former has about 60 to 75 per cent. earthy substances mixed with it. The Passau graphite, however, can be purified by a very simple and inexpensive process, and a substance produced that is quite equal to the Ceylon graphite. Unfortunately, owing to local conditions, this process is little used, as the deposits are spread over a number of small proprietors who work on a small scale in the cheapest manner possible; the result is that there is a regrettable waste of the raw material, and it is alleged that nearly 90 per cent. of the mineral is absolutely thrown away owing to this unscientific and short-sighted system of working, which must lead to the premature exhaustion of the deposits. In 1898 there were 49 graphite works in Bavaria, employing only 216 men, which produced 4,593 tons of graphite, worth £19,583.

Water Gas as Fuel for Blast Furnace.—A recent number of the *Engineer* gives an interesting account of efforts to utilize water gas as a fuel for blast furnace smelting, made by C. C. Longridge. He claims that by employing water gas, the regulating factors, which produce a reducing effect, or otherwise, with ordinary fuel, are non-existent, as the chief reducing agent, carbon monoxide, is produced outside the furnace, and can be introduced and burnt exactly when it is required. He admits that this limits the extent of the fusion zone, a limitation which seems conclusive against such practice in the case of iron smelting at least. The difficulty would not be so serious in the case of lead and copper smelting, and it is even conceivable that it might possess certain advantages, since the atmosphere in this zone could be held perfectly neutral without attaining very high temperatures. It is difficult, however, to see how blast furnace smelting could ever prove successful without the use of solid fuel, since the tendency to agglomeration of the charge could not readily be overcome, and this would prove fatal to reduction of the metal and the proper formation of slags.

Ingenious Automatic Sampler at Deloro.—An ingenious automatic sampler for pulp has recently been designed and put in use by Mr. P. Kirkegaard, manager of the Canadian Gold Fields, Limited, Deloro, Ont. It consists of a bucket of elongated rectangular shape at the mouth, drawn down at the bottom to a small size, where a flexible tube draws off the pulp falling within it. This bucket is mounted on the end of a swinging arm, and is caused to swing across the path of a falling stream of the material to be sampled. This is effected at regular intervals by a simple mechanism, driven by an undershot wheel set up in the launder carrying the pulp to the sampler. It thus runs by its own power. The speed of the mechanism can be regulated so as to take a sample as frequently as may be necessary to secure an accurate average of the pulp.

Asbestos Mining in Canada.—The matrix rock of asbestos at Thetford, Canada, is serpentine, and the asbestos is a silky, fibrous form of this mineral, usually designated by mineralogists as chrysotile. It occurs in veins, seldom in their maximum development over three inches wide, occasionally six, and far more commonly one inch. It is recognized instantly by the sheen and lustre of its surface. These veins traverse the dark serpentine rocks in varying directions, and the excavations made in this hilly country to reach these valuable skeins of mineral thread are very extensive. The production of asbestos from this source, viz., chrysotile, has greatly increased since its first discovery and has now attained the dimensions of a large and valuable industry. There are three grades of asbestos, and of these the second is the most abundantly produced. Much of the floor of the Thetford mines, which is now being deepened, yields a poorer quality than the cliffs or sides. The best grades have been found below the surface. The surface specimens are harsh and asperated. The veins are sharply separable from the inclosing serpentine, and blow of a hammer will detach adhering rock on either side, liberating the lustrous bar of delicate mineral silk, which, soft and silken in its separate fibres, resists compression in the direction of their lengths. These bars are hackled and converted into woolly-like knots which are afterwards carded and spun into asbestos thread. The treatment of the second and third grade asbestos varies somewhat from that of the first quality, and the final discharge of the jig-sieved fragments meets the discerning inspection of small boys who pick out useful material, which is again worked over. Much of the water-saturated material is dried over in ovens.

Forty-Third Mining and Milling Co.—The annual general meeting of the shareholders was held at Ottawa on 24th. inst. Directors report for the year adopted. With completion of development work, good returns are expected this season from the company's property in the Omenica district, B. C.

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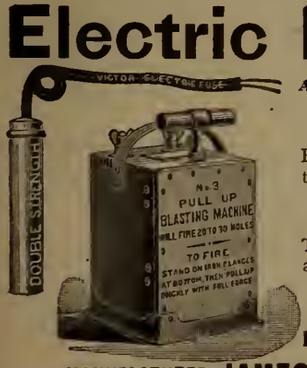
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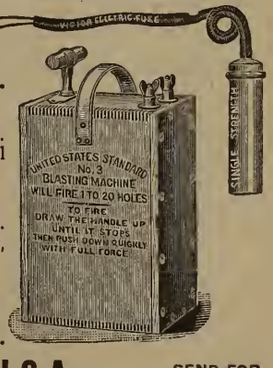

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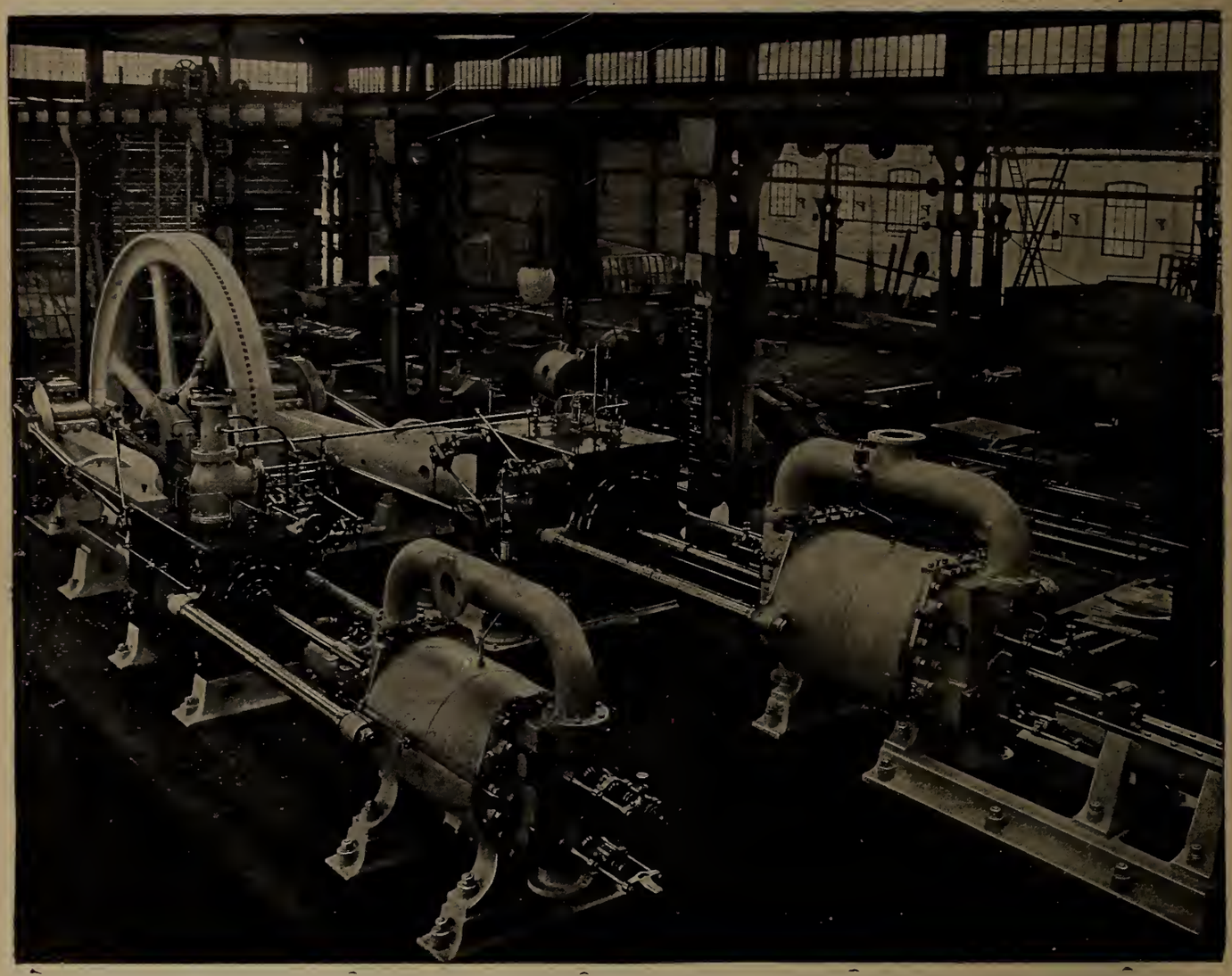

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Messrs. WALKER BROTHERS, Pagefield Ironworks, Wigan. May 10th, 1897.

Dear Sirs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. Moir.

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All royalties on ores and minerals reserved by the Crown have been abolished, and all reservations of mines and minerals in patents or leases (excepting patents issued under the Public Lands Act and the Free Grants and Homestead Acts) have been rescinded and made void.

For copies of the Mines' Act, Reports of the Bureau of Mines, Maps of the mining regions, and other information relating to the mines and mining industry of the Province, apply to

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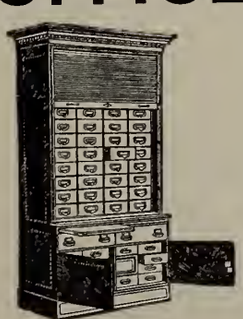

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GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

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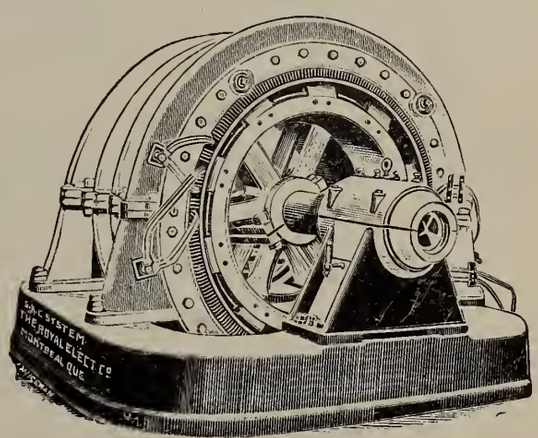

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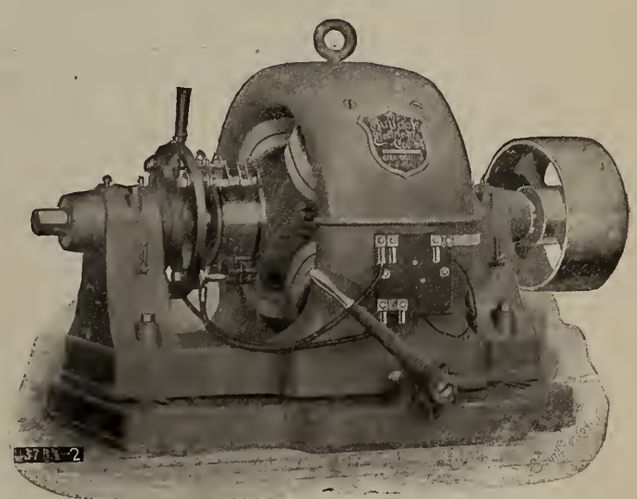

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SYLLABUS OF PAPERS.

The Syllabus of Papers for discussion at these meetings embraces a large variety of subjects of interest and value to Canadian mining men. Among those who have entered their names may be mentioned :—

Mr. HIRAM DONKIN, Glace Bay, C.B.
Prof. COURTENAY DEKALB, Kingston, Ont.
Mr. BERNARD MACDONALD, M.E., Rossland, B.C.
Mr. S. S FOWLER, S.B., Nelson, B.C
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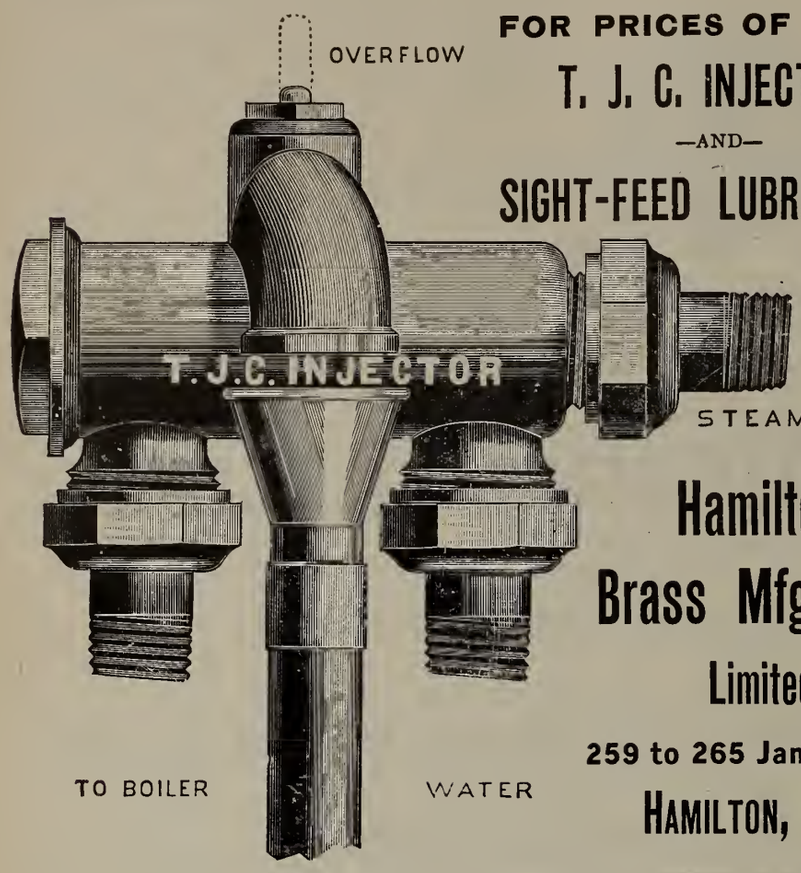

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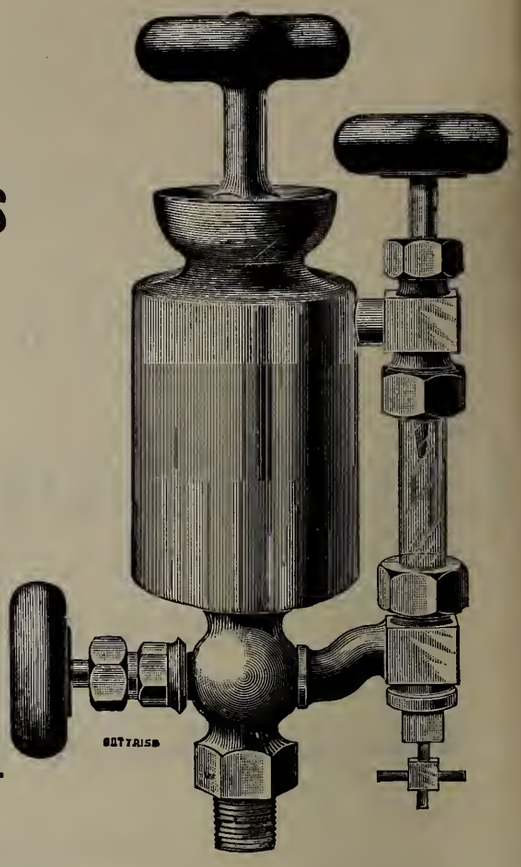

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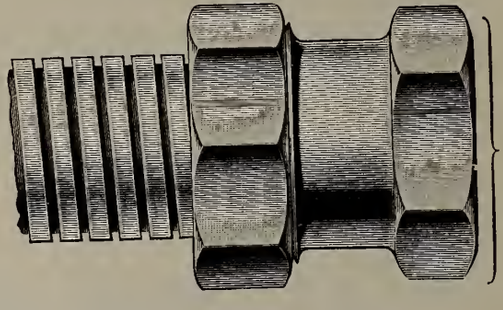

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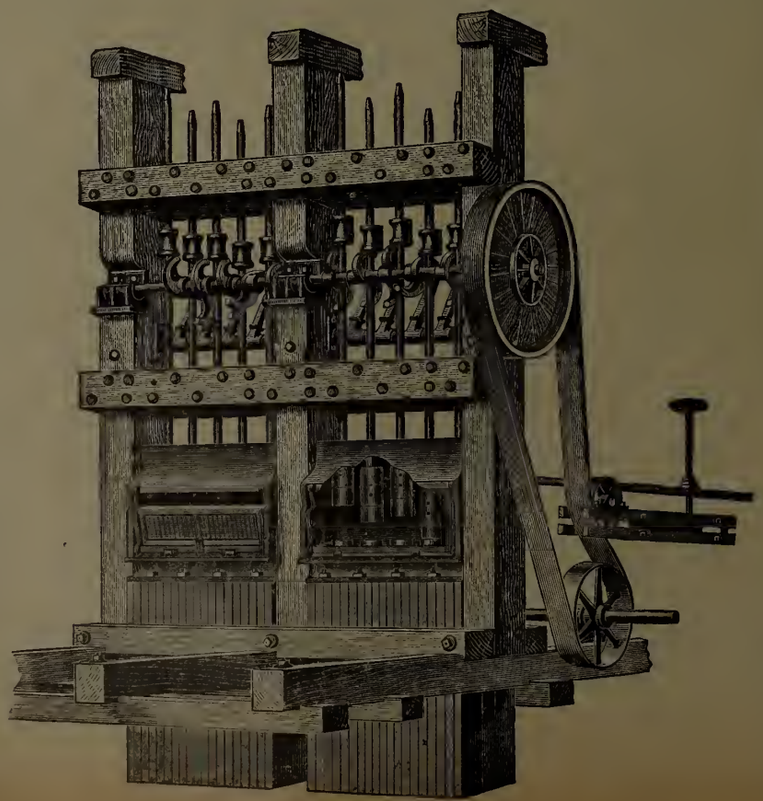

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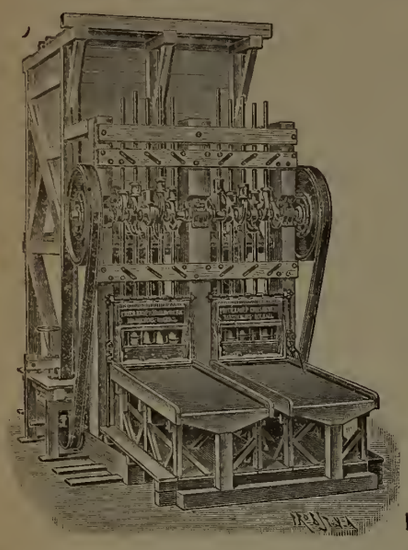

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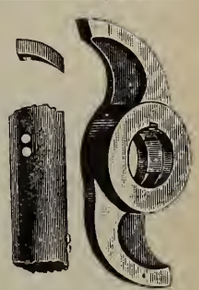

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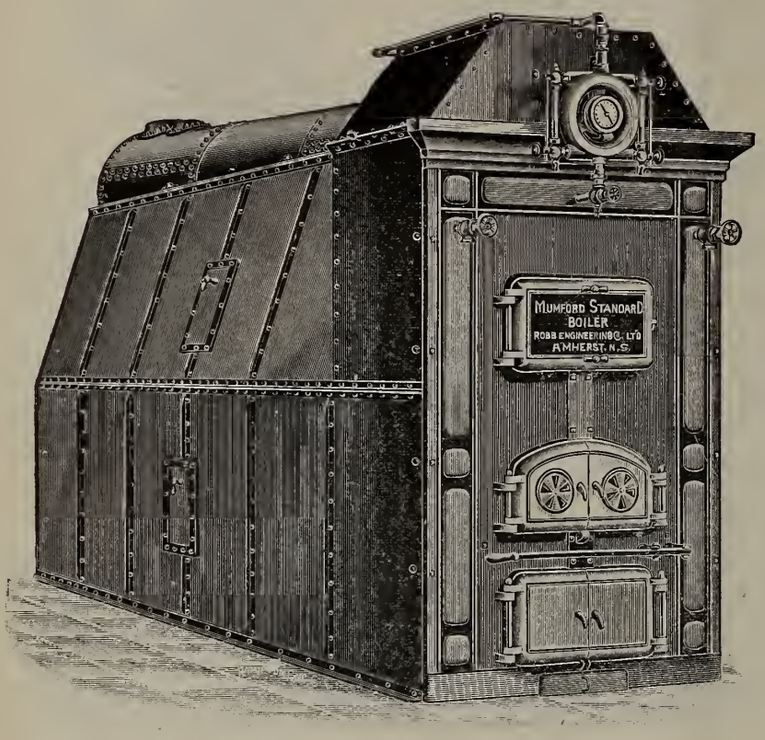

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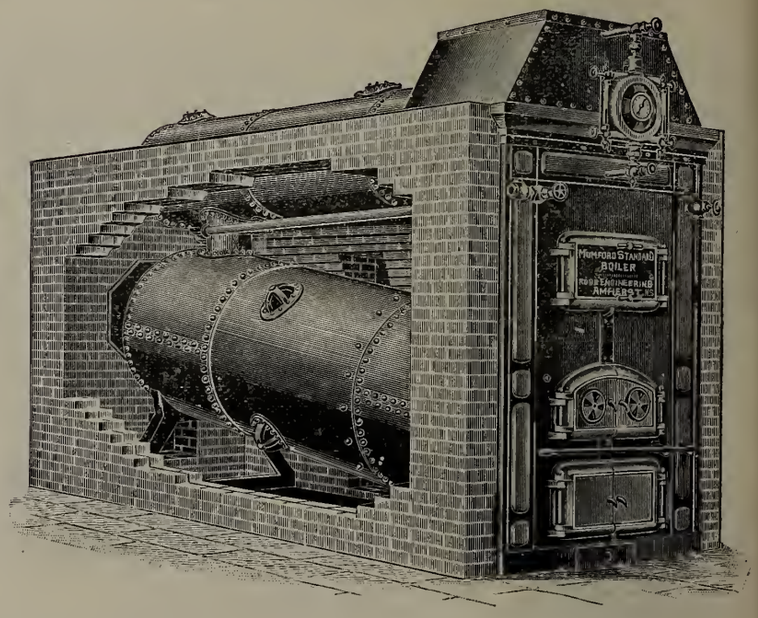

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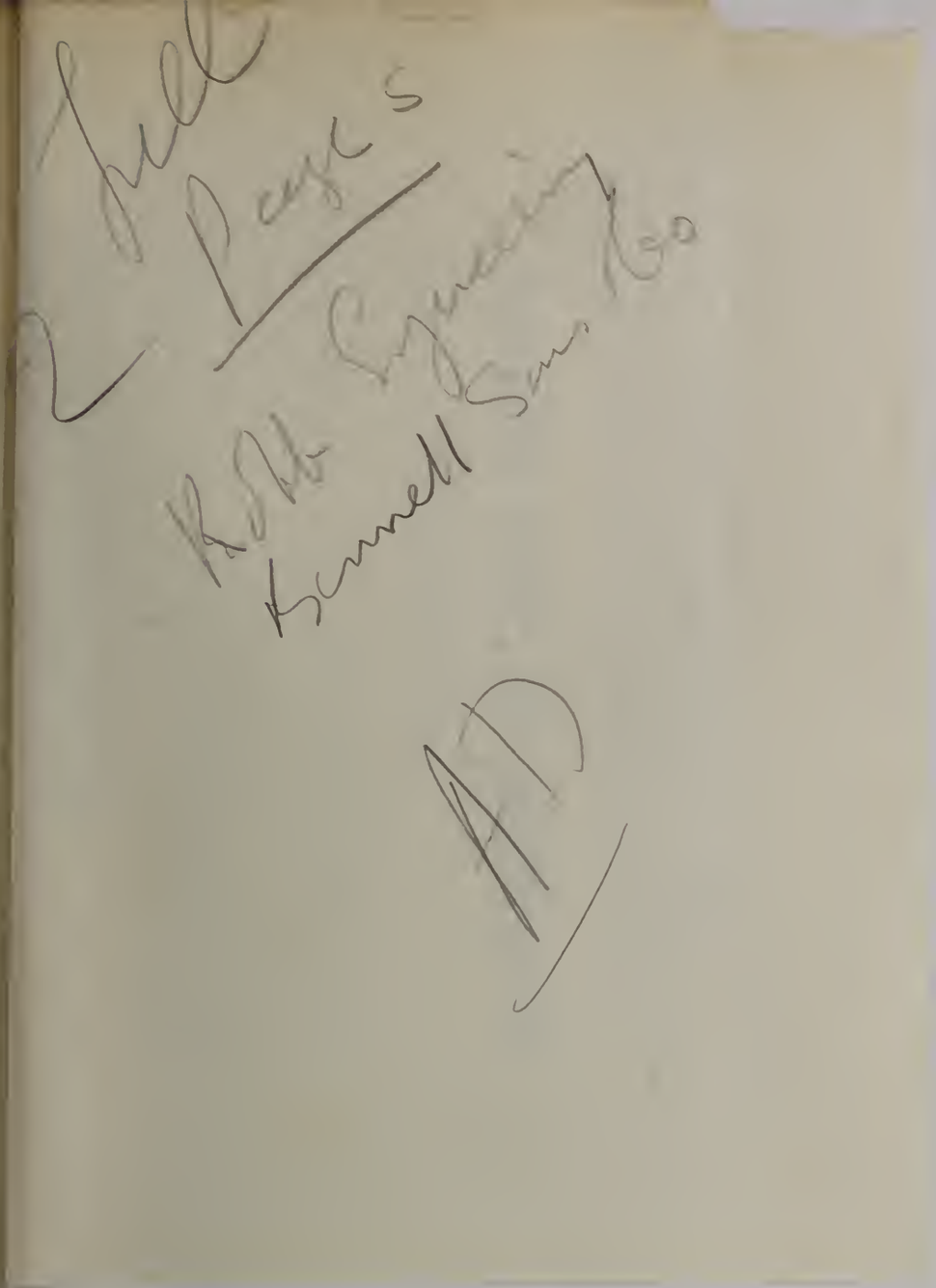

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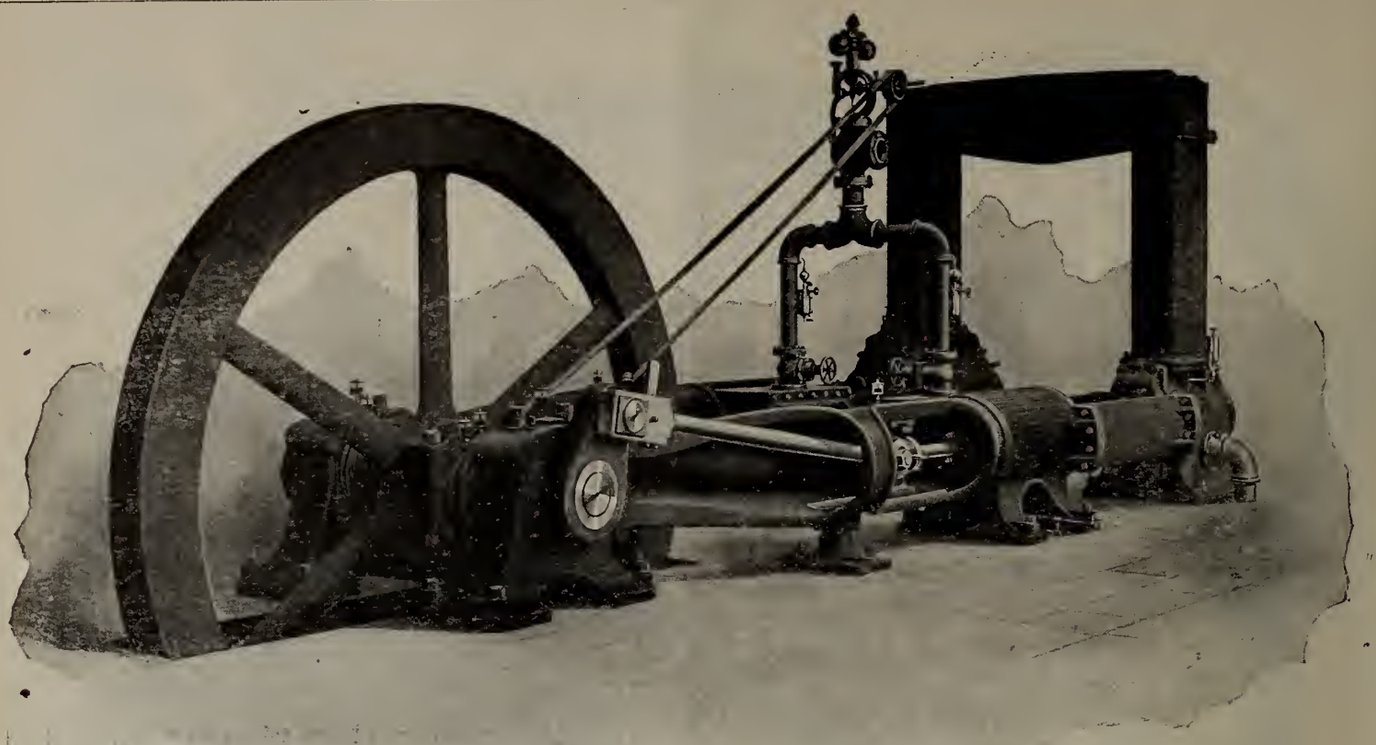

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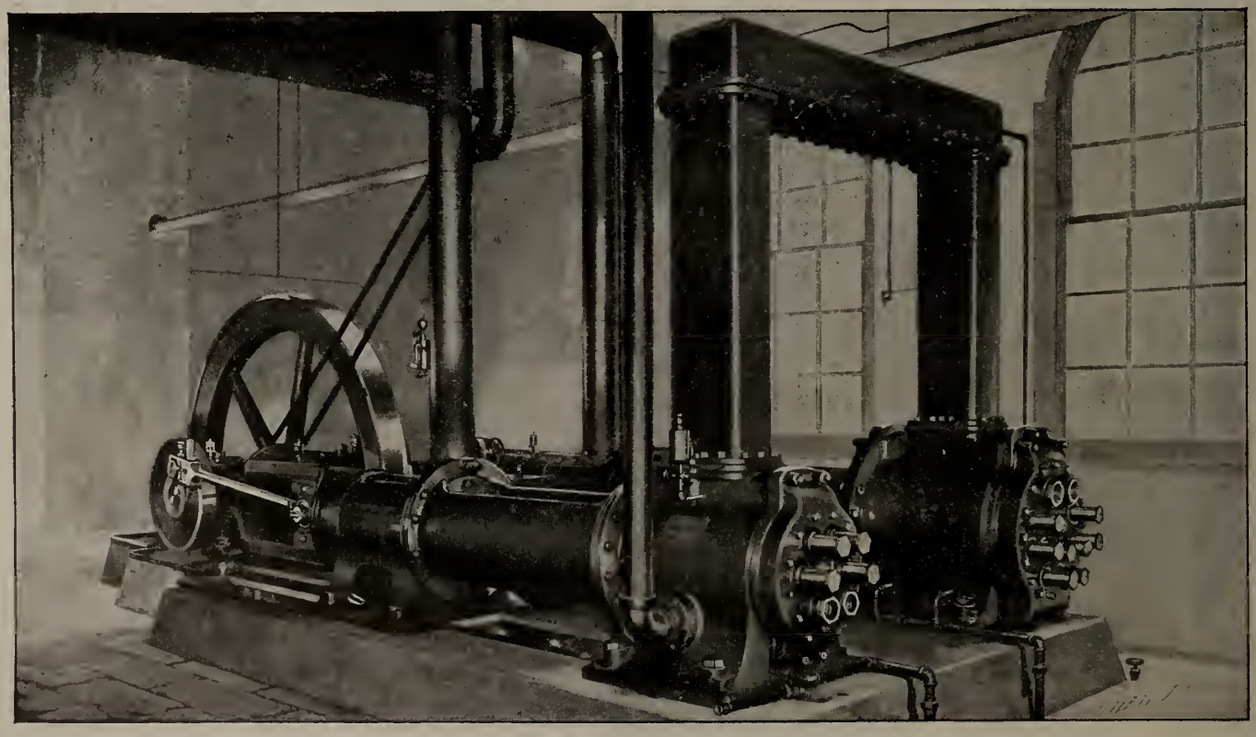

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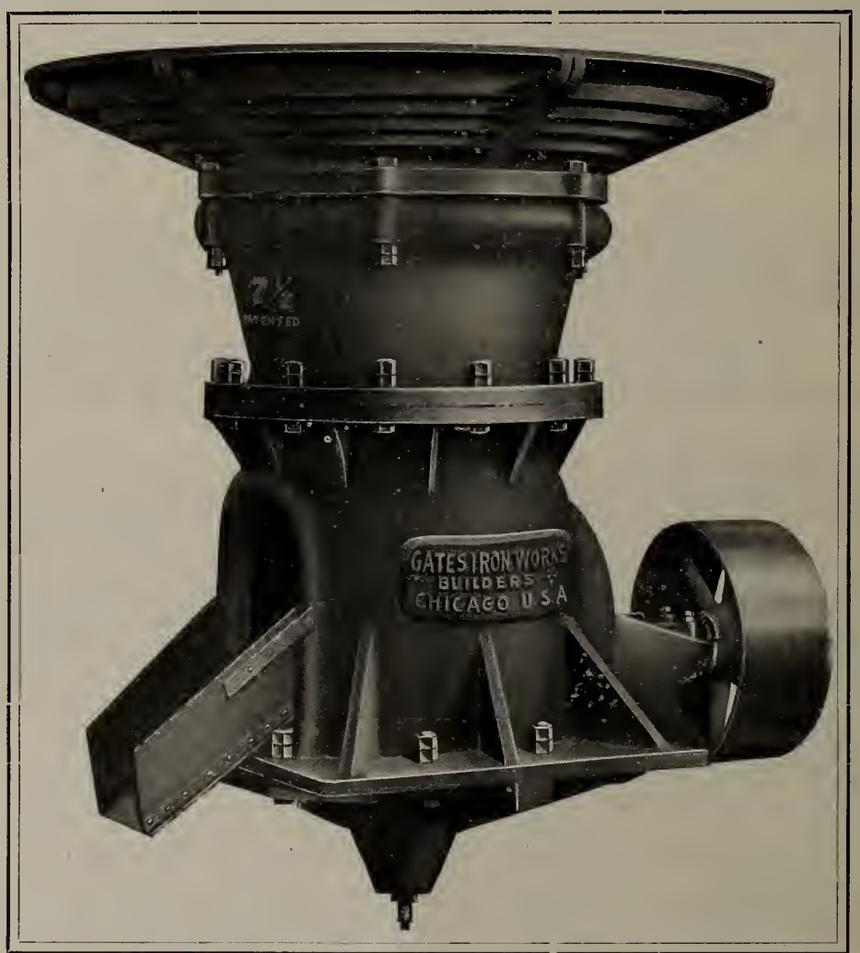

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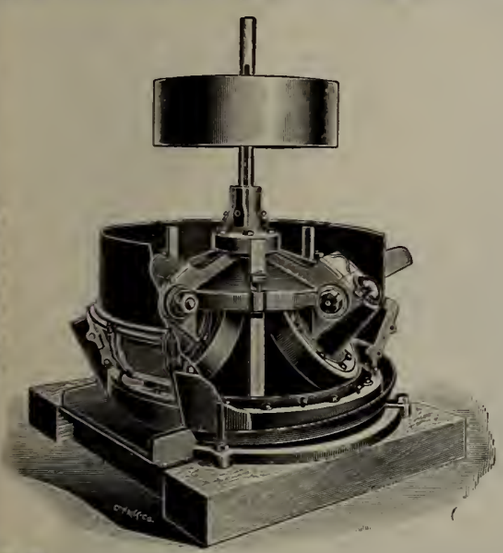

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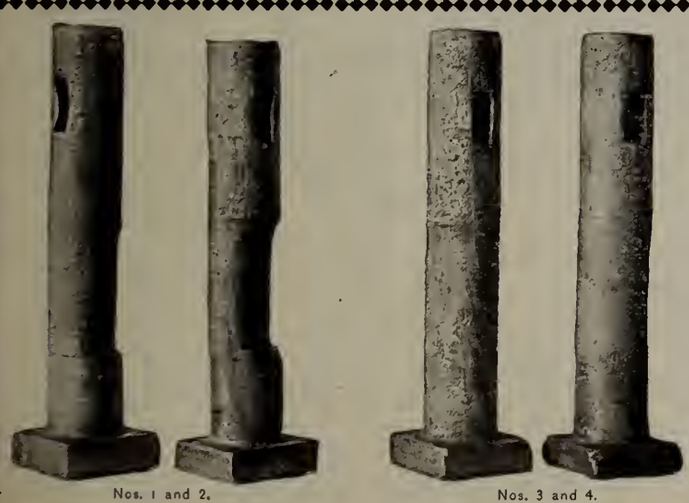

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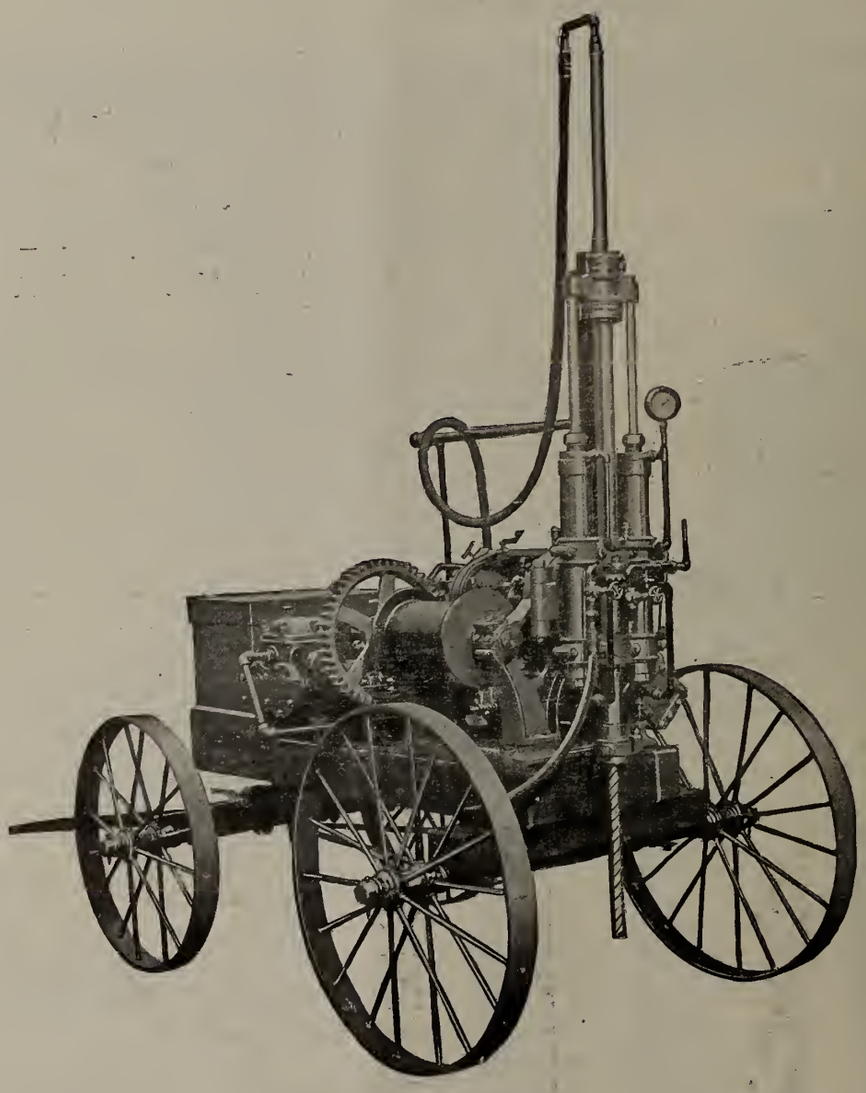

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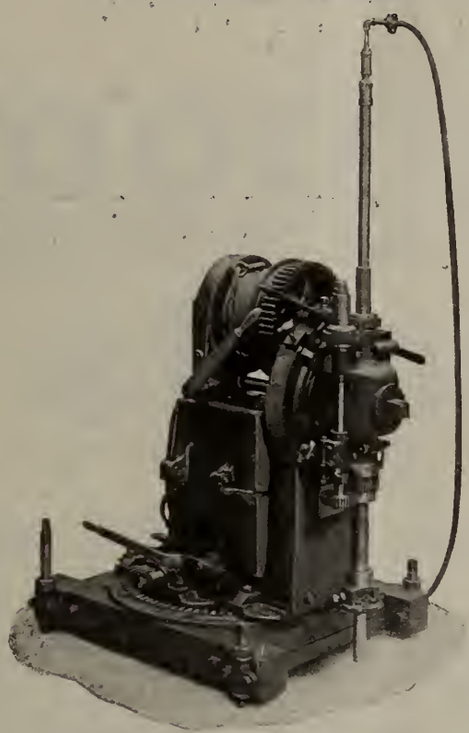

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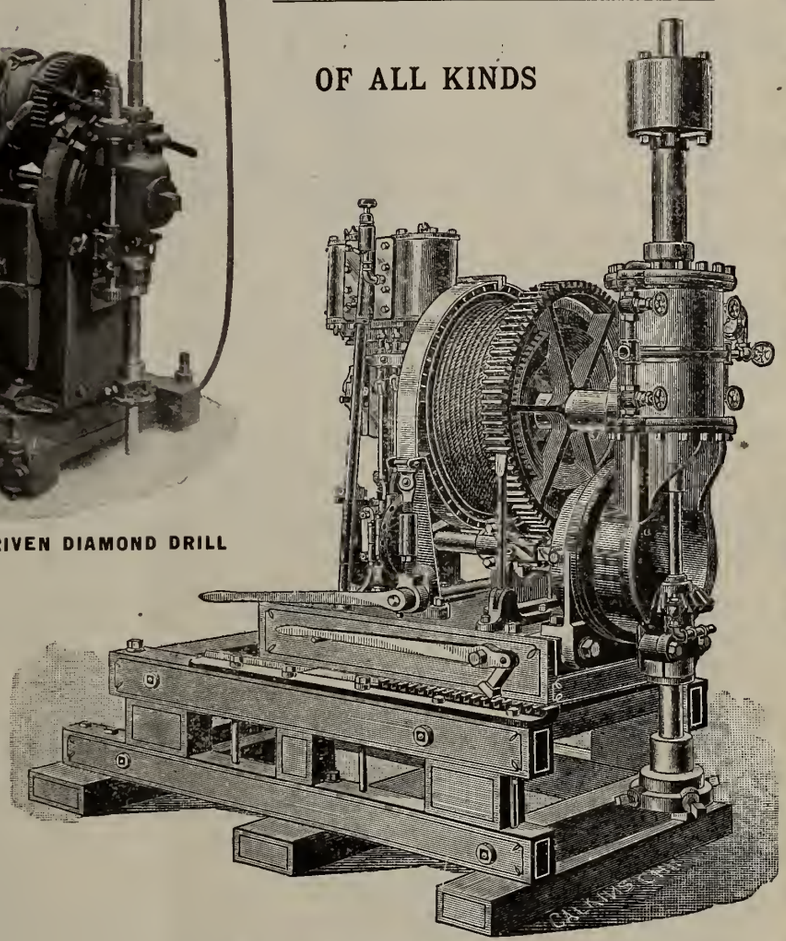

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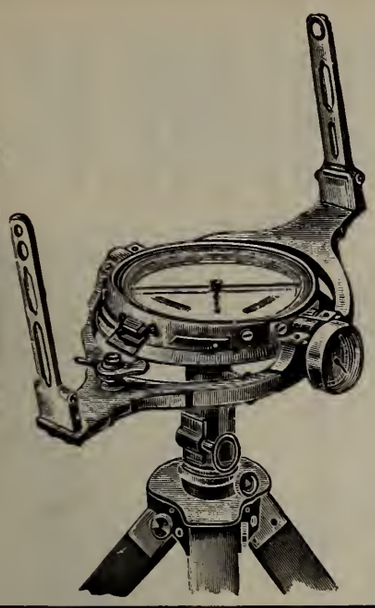

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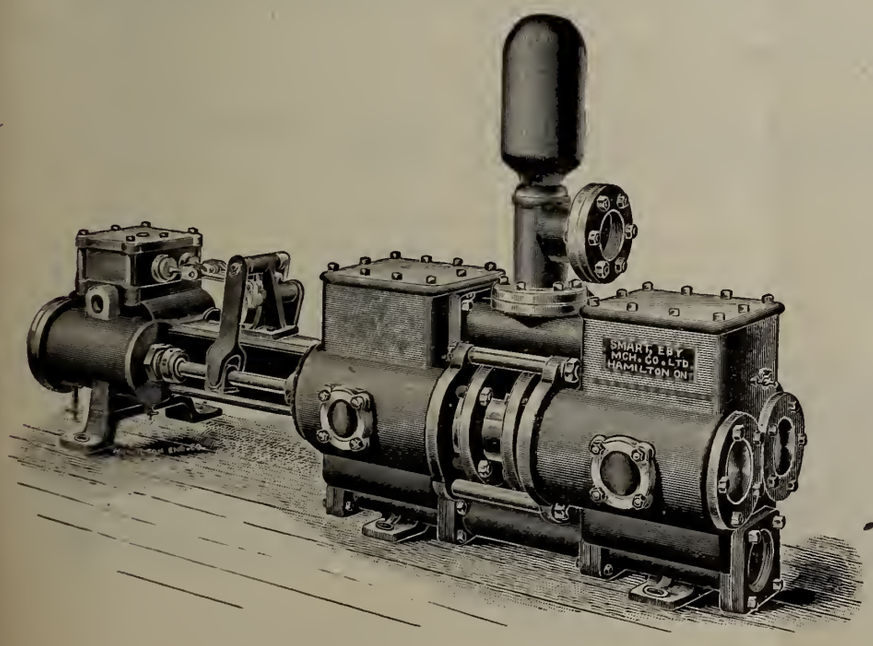

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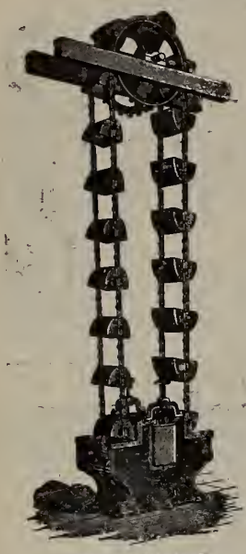

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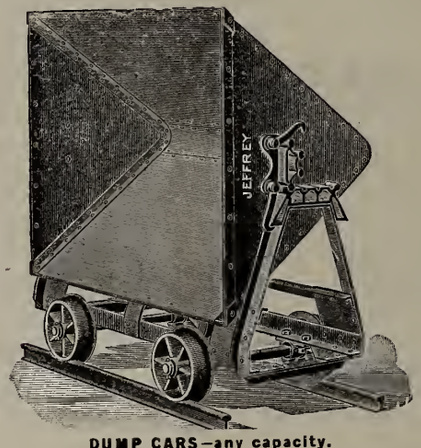

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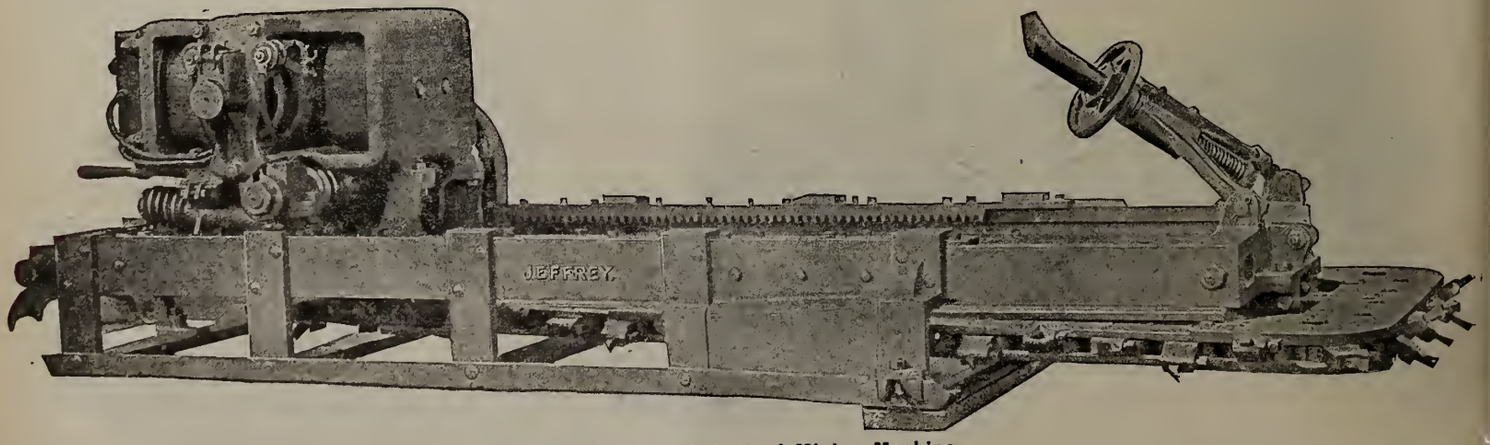

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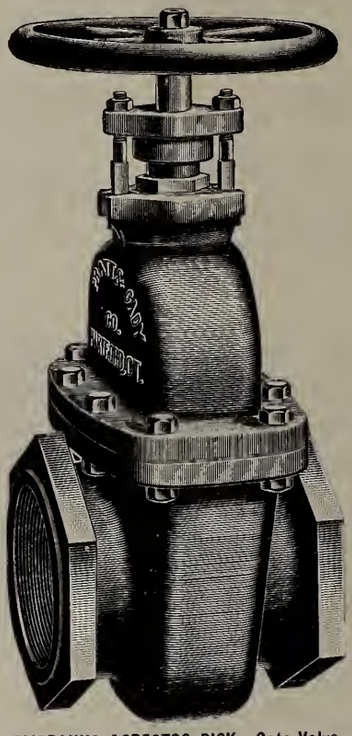

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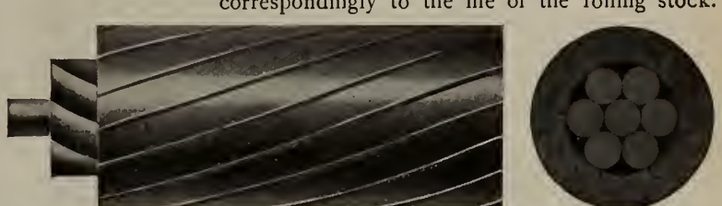

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The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

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The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

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1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

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Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,
Commissioner Public Works and Mines,
HALIFAX, NOVA SCOTIA.

5-STAMP MILL

New and complete; built by a well known maker. Will be sold at a bargain. Apply

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OUR 1897 CATALOGUE ON APPLICATION

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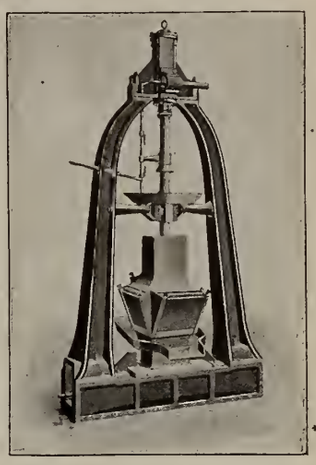
(PATENTED)

Is entirely self-contained.

Is easily operated.

Is superior to any other Steam Stamp Mill.



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It is not necessary to stop the operation of the Mill in order to

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The following mineral lands, situate in the District of Algoma, Province of Ontario, numely:

	Acres
Lot 7, Con. 2, Denison Township, containing	290
Lot 1, Con. 4, " " "	263
Lot 2, Con. 4, " " "	315
Lot 3, Con. 4, " " "	315
Lot 4, Con. 4, " " "	315
Lot 5, Con. 4, " " "	319
Lot 6, Con. 4, " " "	318
Lot 12, Con. 3, Graham " "	274
Lot 12. Con. 4, " " "	290
Total	2,699

belonging to The Vermillion Mining Company of Ontario, will be sold at public auction, en bloc, at the Auction Room of C. J. Townsend, Toronto, Ontario, on the 14th day of May, 1901, at the hour of 12.00 o'clock noon, to the highest bidder. Terms of sale 10 per cent. cash, 15 per cent. in thirty days, 25 per cent. in four months, 25 per cent. in nine months, and 25 per cent. in eighteen months, the unpaid purchase money to be secured by mortgages bearing interest at five per cent. per annum. The Mortgage to be settled in case of dispute by the Junior Registrar of the High Court of Justice, subject to Appeal to a Judge of the High Court.

Possession not to be given until the first 25% of the purchase money shall have been paid.

The purchaser may pay the whole of the purchase money in cash if he desires.

Premises may at any time be inspected on behalf of the intending purchasers, and samples of ore for the purpose of assays taken away up to the limit of 500 pounds upon the production of the written permission of Messrs. McCarthy, Osler, Hoskin & Creelman, or of Messrs. Beatty, Blackstock, Nesbitt, Chadwick & Riddell, both of Toronto, Ontario.

References may be had for particulars of samples and analyses of ore to the Director of Mines, Toronto.

The said mineral lands are very valuable, being rich in copper, nickel and platinum.

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Per H. P. McINTOSH, Secretary,
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ANALYSES of all materials made with greatest accuracy.
SAMPLES BY MAIL—1 cent per 4 ozs.; limit 24 ozs.
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Concentration Tests—100 lbs. or car load lots. Write for terms.
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Mining Engineer, Analytical Chemist and Assayer

THREE YEARS IN THE KOOTENAY.

Properties Examined and Reported on for intending Purchasers.

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REVELSTOKE, B.C.

ANALYTICAL CHEMIST AND ASSAYER.
FROM ROYAL SCHOOL OF MINES, LONDON.

Seven years at Morfa Works, Swansea; seventeen years Chief Chemist to Wigan Coal and Iron Company, England, is now prepared to undertake every description of Analyses or Assays.

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MINING ENGINEER AND ASSAYER.

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Surveys, Reports, Prospecting, Development.
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Galvanised Sheets and Hoops, Tin Plates, Zinc Sheets and Discs, Spelter, White Lead.

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Sole Agents for the Sale of **STEEL JOISTS, RAILS, BILLETS** from the Micheville Steel Works Co.
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The Canada Company

For list of lands and terms apply to the Company's Mining Inspector and Agent

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OLDEST EXPERTS IN

Molybdenite,
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Wolframite,
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Nickel Ore,
Cobalt Ore,
Cerium, and
all Ores
and
Minerals

Talc,
Mica,
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Specialty made of Silver-bearing Ores and Mattes—Copper Ingots, Wire Bars and Cakes—Ferro-Nickel and Ferro-Nickel Oxides for use in preparing Nickel Steel for Armour Plates.

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Independent Ore Sampling Works at the Port of New York. Only two such on the Atlantic seaboard

We are not Dealers or Refiners, but Receive Consignments, Weigh, Sample and Assay them, selling to highest bidders, obtaining advances when desired, and the buyers of two continents pay the highest market price, in New York Funds, cash against our certificates.

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ALSO ANALYZE EVERYTHING.

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Various brands, for makers of Malleable Castings, for Furnace Lining and Annealing, for Mica Lubricants, for Fire-proof Paint and roofing mixtures, for paper makers, etc.

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"With regard to the Stamp Shoes and Dies, "Cams, and Cam Shaft Boxes, they are the best "I have ever seen. I would suggest that you "hold fast to them without change of any kind."

Write us, if you are in the market for a new mill, if you wish to enlarge your present plant, or if you need supplies, or duplicate parts of any kind. We can design and build a complete plant to suit your location, or fill your smallest order.

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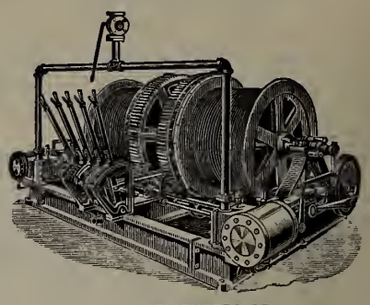

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MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS.

Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

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Wire Screens

FOR EVERY CLASS OF MATERIAL.

Perforated metal of Steel, Copper, Brass, Zinc, for all purposes. Special attention given to

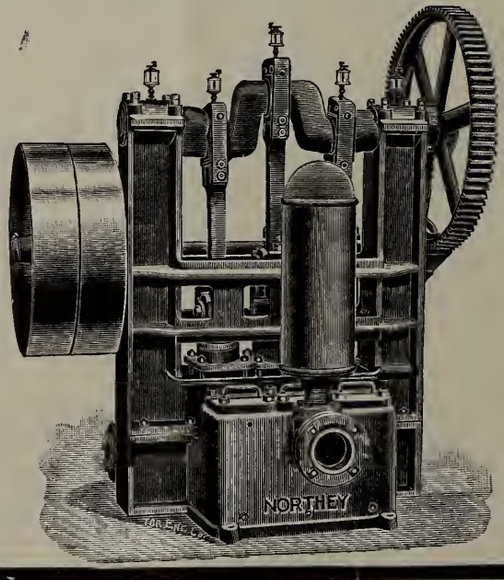
MINERS' REQUIREMENTS.

Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

THE NORTHEY CO., Limited, Toronto, Ont.

19th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 2. FEBRUARY, 1901. VOL. XX., No. 2.

Mining Progress in Ontario.

In Ontario the mineral industry during the year 1900 has on the whole made good progress, in some branches remarkably good, and it is probable that the statistics for the twelve months when published will show a gratifying increase in the aggregate output.

In copper, nickel and iron the advance has been marked, while gold will probably show a somewhat smaller yield than last year.

Production of structural materials, such as brick, stone and lime, always a barometer of prosperity, has been active, and to this list of materials must be added cement, mostly Portland, the home market for which promises ere long to be fully supplied by Ontario manufacturers.

Petroleum continues to be produced at the rate which has characterized the past number of years, and it is not likely, unless the attempts now being made to reach the supposed reservoirs in the Trenton limestone prove successful, that this rate will prove capable of much acceleration.

Natural gas, that ideal fuel, flows in large volumes from the wells of Welland and Essex, but in the latter field a diminishing yield is reported, and an outcry is being made against further export to Detroit. The supply to Toledo has already been cut off.

The salt beds of Bruce, Huron and Lambton contribute a portion of their enormous stores to satisfy the requirements of the Province, and the salt makers are able to get a rather better price per barrel than formerly, but continue to complain of competition with the English article and the impossibility of trading with the United States.

Of the minor minerals, mica has been in brisk demand and larger supply than in 1899; the auriferous mispickel ores of Deloro are yielding considerable quantities of arsenic as a bye-product, zinc ore is being produced near Rossport on the C. P. R. and exported to Belgium; graphite is being mined and shipped in Renfrew County and the extensive bodies of corundum which have within the last two or three years been shown to exist in Eastern Ontario are begining to be worked and to yield quantities of the crushed and graded article for abrasive use.

The remarkable rise in the price of pig iron which took place in 1899 led as a natural result to an increase in production and a search for new deposits of ore. The magnetite mines of Eastern Ontario have been pumped out and overhauled, and a number of them have been producing and shipping ore, some of which went to the blast furnaces at Hamilton and some to smelters south of the line. The production of iron ore in Ontario in 1899 was 16,911 tons, which is not more than one-quarter or one-fifth of the output of 1900. This large increase is due to the opening up of the Helen hematite mine in Michipicoton by Mr. Clergue, the development of which in so short a time is a tribute to the energy with which the "Jason of Algoma" carries on his operations. The body of ore in the Helen mine is a very large one, doubtless containing many millions of tons, and the ore is of good, though non-bessemer quality, running pretty uniformly about 55 or 57 per cent. of metallic iron. The bulk of the output for 1900 was carried by boat to the new blast furnace built by the Canada Iron Furnace Company at Midland, and blown in in December last. A sample cargo was sent to Ashtabula, and Mr. Clergue is credited with the intention of entering into competition with the mines of the Mesaba and Vermilion ranges in supplying the furnaces of Cleveland and Pittsburg, in spite of the duty of 40 cents per ton. The Helen mine was discovered in 1897 and but little work done on it until after it passed into Mr. Clergue's hands in 1898. Since that time a railway twelve miles long has been built, ore docks constructed, steamers brought from England to carry the ore and next season will probably see half a million tons taken from the mine. The Midland furnace makes the third in operation in the Province, the other two being at Hamilton and Deseronto. The last named makes charcoal iron exclusively, and at Hamiiton the first open-hearth steel ever made in Ontario was produced during the present year. Two crucibles are in steady operation with a capacity of about 15 tons per day each. At both Hamilton and Deseronto the ores made use of have been chiefly from the American side of Lake Superior, but since an abundant supply of equally good ore has been has been laid bare at Michipicoton, it is quite probable the wants of of the furnaces will be supplied from our own Province. New blast furnaces are being projected at Collingwood and Kingston, the former by the Cramp—Ontario company, the stock of which is at present being offered to the pubtic. Drilling in the Mattawin iron range has been going on nearly all the year but it is stated that the ore proves mingled with considerable jasper. On the Atik-O-kan range, further away, the McKellar Bros. of Fort William have sold their magnetite locations to an American company, who are now stripping and opening up the properties and propose to work them extensively during the present year. Extensive deposits of magnetite are reported from the Lake Temagami country.

In copper, the old Bruce mines, on the north shore of Lake Huron, are being put in commission again. An English company with an American manager (a good combination in mining) is providing the capital, and large works are in course of construction. At Rock Lake, too, a short distance away, a very promising prospect is passing into the mining stage, and a similar condition prevails at Massey where the Orford Refining Company (or the Ontario Smelting Company) is opening up a newly discovered copper vein which promises both depth and richness. This Company is also putting up a concentrating plant at

Copper Cliff, to re-treat the Canadian Copper Company's mattes and raise their metallic contents to about 80 per cent., as well as to reduce to matte the ores from its own Massey mine. The McGown and Wilcox mines near Parry Sound are being opened up.

The copper-nickel ores of the Sudbury region are being developed in an eminently satisfactory manner. The pioneer company (The Canada Copper Company) is producing more extensively than ever and its operations show what success can be achieved by skill and energy backed by capital. Dr. Ludwig Mond, the English scientist, is developing a property at Victoria mines and will smelt the ore, bringing the matte up to 80 per cent. metallic contents before shipping it to England, to be refined by the process of his own invention. Mr. Clergue is putting the Gertrude nickel mine in Creighton township in shape. It is from this property that he proposes to draw his supplies of nickel ore for manufacturing ferro-nickel and nickel steel at Sault Ste. Marie. The pig iron for his steel rail plant he will bring from Midland for the present, but it is on his extensive programme to erect a blast furnace or furnaces at the Sault for the reduction of his own iron ore, and looking into the not distant future he discerns a market in the shipyards of England and Scotland for the plates and sheets he will make at Sault Ste. Marie. The Frasch process of refining nickel which was brought into prominent notice some months ago is still being experimented with by the nickel-copper company at Hamilton, but so far operations on a commercial scale have not been begun.

The gold mining industry of Ontario has not as yet come up to the sanguine expectations which were entertained three or four years ago. Stock manipulations have in some cases taken the place of honest mining, gross incompetency in others has led to muddling away the money of shareholders with little or nothing to show for it, and in still others funds have been laid out with a lavish hand where the prospect of success was slight from the start. The close of the year sees only three mines in western Ontario producing bullion, viz., the Mikado, Sultana, and Sakoose. The last named is a new property near Dyment station on the C.P.R., owned by the Ottawa Gold Milling and Mining Company, who carry the ore 136 miles by freight and mill it at their reduction works at Keewatin. The Mine Centre group of mines are all idle, including the Golden Star, Olive and Foley. A new company is being formed to take over the first named of these three, and the outlook for a resumption of operations is hopeful. At Sturgeon lake about seventy miles north of Ignace station on the C.P.R., some very promising finds of gold both in wide and narrow veins were made last summer, and at least one 10—stamp mill is now going in over the ice. It is to be hoped the results will show this action to have been warranted, though in other parts of the gold field experience has shown it to be the part of wisdom to spend money in proving the existence of gold in paying quantities before rushing up surface works. In eastern Ontario the mispickel mines of Deloro are yielding both gold and arsenic, and it would appear that the knotty problem of treating these refractory ores has found a satisfactory solution. In Belmont township free-milling quartz is being crushed with favorable results by the Cordova Exploration Company.

The West End Syndicate has been producing silver in considerable quantity from the mine of that name west of Port Arthur.

Pyrites is being mined near Millbridge, Hastings county, and a large deposit near Port Arthur is being uncovered.

The outlook for 1901 is good, and there is reason for believing that the mineral industry of the premier Province is entering on an era of progress such as it has not yet seen.

Canadian Mining Institute meetings, Montreal, 6th. 7th. 8th., March. All mining men welcome.

Lead Refining in Canada.

Recent developments south of the border have brought the lead miners and smelters of Canada face to face with a difficult question. The public is familiar with the attempts which have been made to establish lead smelting in the Dominion on a stable basis, and has seen failures at Golden, Revelstoke, and on Kootenay Lake, while successful smelters at Trail and Nelson are only beginning to get on a firm basis and there is no refining. In seeking for a reason for the failures, it may be said at once that they were not due to a lack of lead ore, nor altogether to costs of fuel or freight. As to ore, there are three or four mines which would be called big lead producers even in the Cœur d'Alenes.

There are two reasons for the backwardness in smelting and the absence of lead refining plants, one of which may be called natural and the other artificial. Under the first head, is the lack, hitherto, in Western Canada of so-called "dry" ores, such as are found south of the line in Colorado, Utah, Montana and Mexico. As there are doubtless many unfamiliar with technicalities of smelting, it may be said that an ore is called "dry" if it does not contain lead. The dry ores of the States are rich in gold and silver and cannot be smelted by themselves. In order to smelt them successfully, they have to be mixed with high grade lead ores as a flux. The lead collects the precious metals which are subsequently separated by refining from the lead bullion produced. In Canada these rich dry ores are lacking, or at least undiscovered at points within reach of the lead ores. In order to smelt lead in Canada, only low grade dry ores are available. These could be availed of to the extent of four tons of dry ore to one of the lead concentrates if the cost of lead smelting was so low, or the market so handy, that the lead smelters could afford to pay a better price for these low grade ores—such ores as are found in Rossland, for instance, and in other West Kootenay camps carrying gold, but too low in copper to be smelted for that metal alone. In the United States, the rich gold ore is the more important, and the lead ore considered a flux. In Canada at present the lead ore is the most valuable and the dry ore the flux. So necessary is lead to the Southern ores that often no smelting charge is made on lead concentrates. The profit comes from the dry ore.

A word only need be said about the market. As in many other cases, the artificial barrier at the frontier prevents Canadian lead from being marketed in the United States. The consumption in Canada probably does not exceed 3,000 tons annually, of the manufactured metal. But Europe and the East can take all that we can produce, and we should be able to hold both of these markets if competition from the United States could only handicap our business through their import duty. But the import tax has fostered and made possible the Lead Trust known as the American Smelting and Refining Company. Before the formation of this trust our lead miners could sell their product for shipment to the United States, even when shipping facilities were much poorer, and there was active competition among rival buyers. Now there is but one buyer, which makes its own terms, and these terms have been recently made more onerous if not prohibitory. To-day the concentrates of the St. Eugene mine, for instance, must seek a market in Germany, Belgium, and even Italy, paying freight charges across a continent and three thousand miles of ocean. Considerable of this lead comes back, by the way, in the form of white lead, litharge, red oxide, orange, etc., as the lack of refineries in Canada and the small duty of five per cent. on white lead, etc, prevent the establishment of these manufactures in Canada. Were it not for the very high grade of the Canadian ores and the silver they carry, these artificial conditions would prohibit lead mining.

When it comes to refining of lead bullion produced here, under

COURTENAY DEKALB,
Mining Engineer,
Inspector of Mines for Ontario.

present conditions, and considered regardless of patriotic or national interests, the lead smelters of British Columbia could afford to pay freight on their bullion to Chicago, for instance, and refine it there, because of two factors usually overlooked in discussing this problem. If the lead were refined in British Columbia, the bullion before refining, would carry about five ounces of gold and 250 ounces of silver per ton. Express charges on the silver to the New York market, at the rate of $8.00 per $1,000 of silver and of $3.50 on each $1,000 of gold, would make the cost of delivering these precious metals about $1.55 more per ton of lead bullion than would be the cost of freighting them to New York in the form of base bullion at say $16.00 per ton. But another and more important condition still further works in favor of the refinery in the United States. When the United States refiner imports lead bullion, to separate the precious metal in bond, he is required to export only 90 per cent. of the lead. This leaves him practically 10 per cent., which he can sell in the States at Chicago prices. A simple calculation will show what he gains—or any United States refining works would gain—under this Government concession.

On a certain day last week, London lead sold at £16 5s. Taking exchange at $4.85 and remembering that the English quotations are per ton of 2240 pounds, this price is equivalent to $70.00 per short ton, or 3.5 cents per pound. On the same day, the price of lead in Chicago was 4.25 cents per pound. If we take freight and insurance from Chicago to London at say $8.00, this subtracted from the $70.00 makes $62.00 per ton, which the imported lead is worth in Chicago. Could this lead be sold for consumption in Chicago, at 4.25 cents, it would be worth $85.00 per ton. But as 90 per cent. of it must be exported, we have the following calculation :

90% at $62.00 per ton is equivalent to.....	$55.80	
10% at Chicago price of $85 00 equals	8.50	
	$64.30	
But if all the lead had to be exported and sold at.....	62.00	
The difference being gain to refiner in the United States.....		$2.30
Add express charges saved on gold and silver..		1.55
		$3.85

Thus the advantage at present in favor of a United States refinery is $3.85 per ton, not considering nearness of market or cheapness of coal. To offset this and to allow the possibility of a little profit until refining as an industry is established in Canada, it is proposed that a bounty, limited in amount and in time and in quantity to which it is applicable, shall be asked of Parliament.

Once established, the Canadian refiners should be able to take care of themselves ; without assistance in the beginning no one would dare go to the expense which the erection of a modern refinery would entail.

The associations of the United States Smelter Trust are close with great railway interests, which can foster their industry to any desired amount, and their absorption of all the refineries in the United States, but two or three, enables them to exact even a prohibitory toll from Canadians. Their recent amalgamation with Guggenheims has brought to them not only additional smelters and refineries in the United States, but has given them a control of the chief lead mines and many of the smelting works of Mexico, and of other producers even in South America. While it is probably true that there still exist in New York and San Francisco two independent refineries, it can easily be imagined that these refineries will be absorbed, whenever it becomes worth while to fulfill the conditions necessary to their acquirement. Not only has all competition ceased for Canadian lead ores, or lead bullion requiring to be desilverized, but charges have been increased to a point making it necessary to export bullion to Europe or abandon the smelting of lead ores rich in silver, or as a last resort, sell out to the Trust.

Of course a bounty should not be given to any one refiner, but allowed 'pro rata' upon the total tonnage of refined pig lead produced from the smelting and refining of Canadian ores, wherever and by whomsoever it be done, and the Government should be assured that no monopoly will be created, either East or West.

We must not lose sight of the incidental benefit which would accrue to other mining, if lead refining becomes a settled industry in Canada. Let us repeat : A refinery will help that class of mines most needing assistance in Canada—the low grade gold mines containing too little copper to justify their treatment by themselves. There are millions of tons of such ore. Again we say :—for every additional ton of lead concentrates smelted four or five tons of these dry ores can be utilized. The miner of lead ores has a very limited market at present. With the tariff-dam on the south, the long haul to Europe, and the necessity of accepting the lower English price for his lead, the limit of profitable assay is easily calculated. If he smelts himself or sells to Canadian smelters, the price he receives is regulated by the profit to the smelter. If it does not pay to refine in Canada under present conditions, the circle is completed and the miner suffers as well as the smelter. If on the other hand a bounty enables the refiner to obtain a foothold in Canada, the miner is in direct line to benefit from the market of refined lead.

It should not take long, with conditions of water transportation so favorable, to take the Japanese and Chinese markets as well as to successfully enter the European field.

The competition with the States is not likely to grow less. New York is likely to become a greater smelting and refining port, for additional South American and even Australian ores, for soon by means of subsidies or other changed conditions in American shipping, there will be regular and cheap connection with other lead producing countries Even at present ocean freight rates, ores are now coming from the west coast of Mexico to be smelted at New York, just as nickel ores are being imported from New Caledonia to the same port. Again, protected by the high duty on the refined metal, and having in mind the greater profits, if they were not obliged to re-export foreign lead, it will surely not be long before the United States Congress will be asked to remove the duty from ores, while retaining the tariff on the metal, but this cannot benefit the Canadian miner as long as the South American and Mexican mines are owned by the smelting trust or its affiliated interests.

Finally, if the Government fails to act at once in this matter, no refinery can be built for a year at least. Our rivals across the line are refusing to contract for a short term even at their present high charges. They will get further entrenched, and by the economy of their combination, by their power to control freights in the States and their ability to refine wherever the costs of fuel and labor are least, can take away from us our legitimate markets of England and the Continent or close down all our lead mines not most favorably situated, and incidentally some of the low grade copper and gold properties of British Columbia and other provinces.

Even when charges warranted the shipment of ores to the United States, Canada "did all the rough work," and assumed the risks of the mine, while the United States reaped more than half the profit—the smelter's and refiner's half—and could determine safely what its profits should be.

Those who are most familiar with copper mining and smelting are predicting the early fulfilment of the expectation that this metal will reach the European consumer from Canada in the form of refined ingots, wire bars, or even in wire and sheets. We are headed in that

direction and moving at a rapid rate. No longer are copper ores shipped in quantity to American smelters. With the exception of to one smelter near the border, the product is now going east to market in the form of matte containing 50 per cent. of copper. The larger works are preparing to bessemerize this matte in Canada before this year is out. The product then will be marketed as pig copper, 98 per cent. fine. The next and last stage will be a copper refinery, for which capital is all ready, and some of our magnificent water powers will be supplying the electric energy to separate from this pig copper the pure metal, and the gold and silver. This copper industry will require no protection and can take care of itself at prices now established But unless Canada is to see its lead mining limited to those mines exceptionally well situated, and lead smelting handicapped and is willing to depend upon United States brands for its refined lead, the industry must be fostered by a bounty. Again we say: A bounty limited in amount, limited in duration and limited as to tonnage.

Freight and Treatment Charges on B. C. Lead Ores.

In its issue of 26th January there appeared in the editorial columns of the *Western Mining World* a reference to certain statements by Mr. E. B. Braden, concerning the comparative freight rates to Omaha from the Cœur d'Alaine country and British Columbia. Being anxious to have some explanation of this article we took occasion, when he was in Ottawa this month, to interview the General Manager of the Trail Smelter. Mr. Aidridge in substance said:

In December, 1899, an offer was made the Canadian Pacific Railway by United States smelters and the Great Northern Railway involving certain freight and treatment charges to the lead miners of British Columbia and a certain freight charge to themselves. The total rate which the lead miners received as a result of this offer resulted in giving to the Canadian lead miners, as it turned out, from $5 to $10 more per ton for their ore than they received during the year 1899. In one instance this arrangement secured for the Canadian Pacific Ry. practically the entire through rate, the United States road only receiving a very small amount for a long haul while the Canadian road received a very large percentage for a comparatively short haul. This agreement also involved a tariff rate of $17.00 per ton to Omaha, which at the time was entirely satisfactory to the United States smelters. Before the end of the year the conditions in the United States had changed materially from what they had been at the beginning of the year. In other words, the supply of lead ore greatly increased while the production of dry ores was materially less. The American Smelter Trust then sent a representative to ask that the agreement which they had proposed and made with the Railway be modified to the extent of their receiving a rebate on the freight rate to Omaha. But the railway took the stand that as this rebate was simply for the benefit of the Smelter Trust and would in no way benefit the lead miners, they must insist upon the agreement being carried out as made. They invited the Smelter Trust to send a representative to meet with their representative to discuss the matter of freight rates for the coming year. The railway used every effort to have a place and date fixed for this meeting previous to January 1st, 1901, and being unable to get the American Smelting and Refining Company to set a place and date, they suggested a meeting themselves, and both the American Smelting and Refining Company and the Guggenheim's Smelters intimated that they would send representatives to this meeting. The railway company therefore had a representative present to discuss these matters, but neither the Smelter Trust nor the Guggenheims were represented. Immediately after this piece of "horse play" upon their part, they sent their agent and representative, Mr. E. B. Braden, to the Slocan country to circulate the report that they were in the market for British Columbia lead ores, but that they had been unable up to the present time to secure satisfactory rates for the year 1901. A meeting of the Slocan mine owners was held, at which Mr. Braden appeared, and he immediately brought up questions of freight rates, which, he stated, were insupportable, and insisted that unless the railway company reduced this rate they would not purchase ores in British Columbia. He furthermore referred to the freight rate to Great Falls, which as a through rate was a fair one, but was one in which the Canadian road obtained for the short haul practically the whole rate. The lead miners of the Slocan pointedly referred to the fact that the Canadian Pacific and the Great Northern had both reduced their freight rates to all points $1.00 per ton, and asked Mr. Braden as to whether he was in a position to give them the same treatment charge as last year, which would have given them $1.00 per ton more for their ore than they had received the previous year. Mr. Braden stated that he was not in a position to do this. They then asked him as to whether he was in a position to quote any rates whatsoever, to which he replied he was not.

Within a week or ten days of the time that Mr. Braden was circulating these reports and being interviewed by different papers in British Columbia, a prominent mine owner of the East Kootenay country wired direct to the Vice-President of the American Smelting and Refining Company, asking him for a treatment charge upon his ore, leaving him to arrange the freight rates. The reply received was to the effect that the American Smelting and Refining Company was not now in the market for lead ores, but that they might possibly be able to handle some ore at their Omaha works. A few days later this correspondence was carried on further, with the result that the East Kootenay mine owner failed absolutely to obtain anything definite whatsoever from the American Smelting and Refining Company, and one of their officers admitted informally that they had been tricked by the Trust and that it was now evident to them that they did not intend to make any rates on British Columbia ores.

In other words, the play of the American Smelting and Refining Company was first to raise the refining charge to Canadian smelters to $4 00 per ton, believing by so doing that they would remove the competition of Canadian smelters; secondly, that they would temporarily withdraw entirely from the British Columbia lead market, thus leaving the Canadian lead producers with practically no market for their products. Considering the fact that the United States smelters had been handling something over 50 per cent. of the lead ores of the country, it certainly left the Canadian smelters in somewhat of an embarrassing position; but I am glad to say that the railway company has, through its Smelting Works and the Hall Mines Smelter, placed within the last month a very large lead output in the east and west Kootenay countries, including the St. Eugene, North Star, Sullivan, Payne and others, and the miners will receive practically as good rates as they received during the year 1900, when the American Smelting and Refining Company took over 50 per cent. of these ores. The American Smelting and Refining Company have therefore found to their chagrin that not only can the British Columbia lead miners live without them, but they have actually been able to obtain practically as good rates as when they were in the market. It is interesting to note that in a recent misunderstanding between various interests in the Trust, the Trust's policy in dealing with the British Columbia situation has been severely criticized by those who are likely in the future to dictate its policy.

There is no doubt but that the relations between the Canadian lead ore producers and the Canadian smelters should be very close, as their interests are to a certain extent the same, and it is only fair to

say, so far as the smelters are concerned, that they have not made more than a fair interest upon their investment in the handling of the lead ores of the country.

If the bounty of $5.00 per ton on pig lead is granted by the Government this session, it will have the effect or not only firmly establishing the lead smelting and refining interests, but it will also secure for the lead miners better rates upon their ores and stimulate largely the lead mining industry, as well as creating a healthy demand for a large tonnage of low grade dry ores which are necessary to mix with the lead ores in the smelting processes.

Referring to Mr. Braden's remarks upon the subject of comparative freight rates to Omaha from the Cœur d'Alene country and British Columbia, I have in hand a Northern Pacific Railway Tariff, No. 4509, which reads as follows:—

"Mullan, Burke, Wallace, (Cœur d'Alene points), to Omaha, Nebraska, $12, $14 and $16 per ton respectively," depending upon whether the ore or concentrates are less than $50 per ton, between $50 and $65 per ton, or over $65 per ton, figuring 100% of the metals at the gross New York prices of refined metals.

On the above basis of calculation, practically all the Slocan ores would take the $16 rate, while some of the East Kootenay would take the middle valuation. It is possible that a later tariff may have been issued than the above quoted, but I doubt whether any has been issued reducing the above tariff rates, and it is safe to say that there never has been a $10 rate issued from the Cœur d'Alene country to Omaha on ore assaying as high in lead and silver as the British Columbia. It might be well for Mr. Braden and the "Western Mining World" to give their authority for their statement that a $10 rate has been made. At any rate the Canadian Pacific rate compares favorably with the Northern Pacific tariff referred to.

Very Bad Form.

Last summer it will be remembered that the American Institute of Mining Engineers visited Canada on the invitation and as the guests of the Canadian Mining Institute and the Mining Society of Nova Scotia. The executive of these bodies went to much trouble in arranging and carrying out the details of an elaborate programme of excursions extending from the province of Quebec, through Nova Scotia and as far as the Island of Newfoundland.

The whole programme from start to finish was arranged and carried out under the entire direction and control of the Canadian societies and the heavy expenses incurred, somewhere in the neighbourhood of $10,000, were provided by the members of the Canadian organisations supplemented by grants from the Dominion and Provincial Governments and special concessions from Canadian railways. In the light of these facts it is, to put it mildly, somewhat surprising to find the following untruthful paragraph in the recently published transactions of the American Institute:—

"This, like the similar result of the transcontinental trip of 1899, was due to the vigilant and skillful management of Mr. Theodore Dwight, Assistant Treasurer of the Institute, who in both cases undertook, outside of his regular work, the arduous task of managing the Institute excursion. This mention is made not only as a well deserved acknowledgement of Mr. Dwight's services, but also as an indication to members, that in future excursions under the same efficient management, they may feel assured of perfect arrangements for their comfort, and of the safety with which they may rely upon preliminary estimates of expense, as at least sufficient to cover the actual cost."

We understand that the attention of Dr. Raymond, Secretary of the Institute, has been called to the offensive character of this impertinent puff by Mr. Theodore Dwight on behalf of Mr. Theodore Dwight.

Canadian Bounties Paid in 1900.

From the annual blue book of the Auditor-General for the fiscal year ended 30th June last we obtain the following figures of the bounties on iron and steel and silver paid by the Dominion Government during that period as follows:—

BOUNTY ON PIG IRON.

Canada Iron Furnace Co. ($18,234.92)—	
Radnor Forges, Three Rivers—	
Production during 12 months ended June 30, 1900—	
6,052·78 tons from Canada ore at $3	$18,158 34
38·29 tons from foreign ore at $2	76 58
Deseronto Iron Co. ($27,026)—	
Production during 12 months ended April 30, 1900—	
462 tons from Canada ore at $3	1,386 00
12,820 tons from foreign ore at $2	25,640 00
Hamilton Blast Co., Ltd. ($107,009.69—	
Production during 12 months ended May 31, 1900—	
11,929·19 tons from Canada ore at $3	35 787 57
35,611·06 " foreign ore at $2	71,222 12
John McDougall & Co. ($5,485.07)—	
Grantham Iron Works—	
Production during 10 months ended April 30, 1900—	
1,828·37 tons from Canada ore at $3	5,485 07
Nova Scotia Steel Co. ($73,162·22)—	
Production during 12 months ended May 31, 1900—	
11,886.225 tons from Canada ore at $3	35,658 67
18.751.77 " foreign ore at $1	37,503 55
Mineral Products Co., Pictou ($7,378.24)—	
Production during 5 months ended Nov. 30, 1900—	
2,459·415 tons from Canada ore at $3	7,378 24
	$238,296 14

BOUNTY ON PUDDLED IRON BARS.

Ontario Rolling Mills Co.—	
Production during June, 1899, from pig iron made in Canada, 400·165 tons at $3	1,200 50
Hamilton Steel and Iron Co., Ltd —	
Production during 11 months ended May 31, 1900, from pig iron made in Canada, 2,973·54 tons at $3	8,920 60
	$10,121 10

BOUNTY ON STEEL INGOTS.

Nova Scotia Steel Co.—	
Production during 12 months ended May 31, 1900, from pig iron not less than 50 per cent. of which was made in Canada, 21,453·43 tons at $3	$64,360 29

BOUNTY ON SILVER.

Hall Mines Co. ($17,482.07)—	
Mined in 1898-9, 31,190 tons (proportion of $30,000, less $71.91, cost of inspection)	$10,442 09
Portion of unexpended bounty of 1895 6, distributed under O. C.	6,629 95
Short paid on output of years 1895 to 1898, inclusive, as shown by inspection	340 03
British Columbia Smelting and Refining Co.—	
Portion of unexpended bounty of 1895 6, distributed under O. C. $6,488.81, less overpaid on output of years 1895 to 1898, $193 40, and cost of inspection, $49.19	6,246 22
Canadian Smelting Works—	
Mined in 1898-9, 57,805 tons (proportion of $30,000, less cost of inspection, $29.35)	19,456 65
W. G. Parmelee, deputy minister, travelling expenses in connection with inspection of miners' books	150 45
	$43,335 39

Central Canada Chamber of Mines.

Last month we referred to the remarkable character of the literature being distributed by an aggregation of Winnipeg and Rat Portage merchants and trades people under title of "The Central Canada Chamber of Mines." Since then the *modus operandi* of this corporation has been considered by the Council of the Canadian Mining Institute who authorize us to publish the following resolutions:—

"The Council of the Canadian Mining Institute having considered the circular letters and publications of an organization called the Central Canada Chamber of Mines, and believing that the indiscriminate publication and distribution of this literature, containing false and misleading statements, is prejudical and hurtful to the mineral industries of Canada;

RESOLVES to put on record this expression of its views on the work and procedure of the Chamber, and at the same time to express its unqualified disapproval of any financial aid or assistance being given to it by the Dominion or Provincial governments, and further

RESOLVES that the Secretary be authorized to communicate this resolution to the President and Secretary of the Central Canada Chamber of Mines, to the Honorable the Minister of the Interior, to the Honorable the Commissioner of Crown Lands for Ontario, and to the editors of the leading Canadian and foreign Mining and Financial press.

In this connection and supplementary which we have already written with regard to this so called "Chamber of Mines" we reproduce the following extracts from letters received since last REVIEW from prominent mining men in the Lake of the Woods:—

"I took issue with the Winnipeg Chamber of Mines and withdrew my name from it at the start. The literature published by Mr. Malcolm is the quintesience of puerility and would be funny if it did not reflect on all interested in the district over which the Chamber has arrogated to itself the position of g andmother."

Another mining engineer writes:—

"Will you allow me to express my congratulations to you for the great service you have done the Mining Industry in West Ontario by the publication of your article on "Geology as She is Wrote."

There is no excuse whatever for the Secretary of the Chamber of Mines, for he has disregarded the repeated warnings of the press and persisted in pouring forth his wild and exaggerated effusions.

The Chamber of Mines is now run by a clique formed from the working executive, merely to further their own ends, regardless of the effect on the country."

Canadian Mining Institute.

The Annual General Meetings of the members of this representative organization of Canadian mining engineers and mine managers will be held in the Windsor Hotel, Montreal on Wednesday, Thursday, and Friday, 6th, 7th and 8th of March next. Business sessions will be held on Wednesday and Friday mornings in the Library of the Institute, Room IV. of the hotel, and sessions for the reading and discussion of papers in the Club Room on Wednesday and Thursday afternoon and evening at three and eight p m. and on Friday afternoon. The members will dine together in the Windsor on Friday evening. By special arrangement made with all Canadian railways members and mining men will be carried to Montreal and returned for a single fare on obtaining Convention Certificate from their ticket agent and on having same signed by the Secretary. The following elaborate syllabus of papers will be presented :—

1. Coarse Concentration in the Slocan District, B.C.
   By Mr. S. S. FOWLER, S.B., Nelson, B.C.
2. The New Mining Plant at the Le Roi Mines.
   By Mr. BERNARD MACDONALD, M.E., Rossland, B.C.
3. A Simple and Convenient Instrument for Mine Surveys.
   By Mr. FRANK ROBBINS, M.E., Kimberley, B.C.
4. The Duty of Stamp Mills in Crushing and Amalgamation.
   By Prof. COURTENAY DEKALB, Kingston, Ont.
5. Notes on Gold Dredging, in Canada and New Zealand.
   By Mr. F. SATCHELL CLARKE, Vancouver, B.C.
6. Notes on Coal Shaft Sinking.
   By Mr. JOHN JOHNSTONE, M.E., Port Hood, C.B.
7. On the Performance of Coal Cutting Machines.
   By Mr. T. J. BROWN, M.E., Glace Bay, C.B.
8. On Coal Shipping Piers.
   By Mr. HIRAM DONKIN, C.E., Glace Bay, C.B.

9 and 10. On the Treatment of Auriferous Mispickel Ores.

   (*a*) By Mr. P KIRKEGAARD, Deloro Ont.
   (*b*) By Mr. SYDNEY B. WRIGHT, Deloro, Ont.

11. On Natural Gas in Ontario.
    By Mr. EUGENE COSTE, M.E., Toronto, Ont.
12. On Company Law.
    By Mr. J. M. CLARK, Q.C., LL.B., Toronto, Ont.
13. A Review of the Iron Industry in 1900.
    By GEO. E. DRUMMOND, Montreal.
14. Notes on Milling Practice at the Athabasca Mine.
    By Mr. E. NELSON FELL, Assoc R.S.M., Nelson, B.C.
15. On the Iron Ore Deposits of Bilbao, Northern Spain.
    (Illustrated by Lantern Slides)
    By Dr. Frank D. Adams, Montreal, Que.
16. Pioneer Work in the Crow's Nest Coal Areas.
    (Illustrated by Lantern Slides)
    By Mr. WM. BLAKEMORE, M E., Montreal, Que.
17. On the Iron Ore Fields of Ontario.
    By Prof. W. G. MILLAR, Kingston, Ont.
18. Notes on Nova Scotia Mining Legislation.
    By ALEXANDER MCNEILL, Barrister, Halifax, N.S.
19. On Coal, Coke and Gas as Domestic Fuels.
    By F. H. MASON, F.C.S., Halifax, N.S.
20. Rope Driven versus Direct Driven Colliery Ventilating Fans.
    By. Mr. FRANCIS T. PEACOCK, Montreal, Que.
21. Comparative Methods of Assaying Nickeliferous Pyrrhotites.
    By Mr. J. WALTER WELLS, B.Sc., Belleville, Ont.
22. On Certain Fault Conditions in the Copper Mines of Butte, Montana.
    By Mr. WM. BRADEN, M.E., Bruce Mines, Ont.
23. The Chemistry of the Limestones of Eastern Ontario.
    By Dr. W. L GOODWIN, Kingston, Ont.
24. On the Magnetic Iron Sands on the North Shore of the St. Lawrence.
    By Mr. J. OBALSKI, Inspector of Mines, Quebec.
25. On the Composition of Some Canadian Limestones:—
    (*a*) For Calcium Carbide,
    (*b*) " Chemical Pulp,
    (*c*) " Portland Cement.
    By Dr. J. T. DONALD, M.A., Montreal, Que.
26. Up the Pitch versus Across the Pitch (Continued).
    By Mr. O. E. S. WHITESIDE, M.E., Anthracite, N.W.T.
27. On Leaching Copper Ores by Sulphurous Acid.
    By Mr. E. P. JENNINGS, M.E., Salt Lake City, Utah.
28. Subject not announced.
    By Mr. CHARLES FERGIE, M.E., Westville, N.S.
29. Subject not announced.
    By Mr. CHARLES BRENT, Rat Portage, Ont.
30. Subject not announced.
    By Mr. W. F. FERRIER, M.E., Rossland, B.C.
31. Notes on Laboratory Work at McGill.
    By Dr. J. BONSALL PORTER, Montreal, Que.
32. The New Coking Plant at Sydney, C.B., with some Notes on the Coking Properties of Cape Breton Coals.
    By Mr. A. J. MOXHAM, Sydney, C.B.
33. On the Occurrence of Nickel in Arizona, U.S.A.
    By Dr. A. R. LEDOUX, New York, N.Y.
34. Subject not announced.
    By Mr. D. W. ROBB, Amherst, N.S.
35. Notes on the Coal Haulage Plant at Port Morien, C.B.
    By Mr. J. G. S. HUDSON, Port Morien, C.B.
36. Subject not announced.
    By Mr. R. G. MCCONNELL, Ottawa.
37. On the Sedimentary Formations of the Province of Ontario and Boring Operations carried on in them.
    By Dr. H. M. AMI, of the Geological Survey of Canada.

STUDENTS COMPETITION

(Entries will be held open until opening Session of meeting.)

38. The Coal Mines at Fernie, B.C.
    By Mr. C. V. CORLISS (McGill).
39. The Concentration of Silver Lead Ores at Gem, Idaho.
    By Mr. W. M. EDWARDS (McGill).
40. Notes on Crushing and Screening under varying conditions in the Ore Dressing Laboratories at McGill University.
    By Mr. W. G. FLINT (McGill).

MORE NICKEL INSANITY.

With the reassembling of Parliament and the opening of another session of the Ontario Legislature, the Hamilton coterie of charter mongers and speculators renew their mendacious importunities whereby they seek to destroy the great copper and nickel mining industries of Ontario. Their latest move may be seen from a glance at the following despatch:—

"TORONTO, Feb. 7.—The Hamilton Steel and Iron Company, the Nickel Steel Company, and the Canada Iron Furnace Company have addressed a memorial to the Ontario Government asking that a tax upon nickel ore and copper and nickel ore, provided for in the Mines Act, be imposed, and that the revenue thus collected be paid as a bonus upon pig iron and upon nickel-steel manufactured in Ontario. Such action would give an immense impetus to the manufacture of nickel, iron and nickel-steel in Ontario. It is also asked that Ontario be given a monopoly of the raw material, and that the Government convey no further lands containing nickel ores to individuals who will not refine nickel in Ontario."

The unblushing impudence of this proposition is realized when one reflects that these pap-fed enterprises, heavily protected by bonuses from the Dominion and Provincial Treasuries, and fattened by special exemptions as to taxation and municipal grants, do not, so far as we are aware, spend one single penny in mining in Ontario. The Hamilton Iron and Steel Company *imports* the great bulk of its iron from the United States, and the Canada Iron Furnace Company *buys* its ores from another company. Neither of them do any mining in Ontario. While we are confident that this proposal to exact a license tax on the copper and nickel mines of Ontario is wholly unconstitutional, and, if imposed, cannot be legally collected, it may not be out of place to recite briefly the views we have repeatedly expressed in these columns concerning this extremely foolish agitation.

That the copper and nickel mining industries of Ontario, which have assumed great proportions and now rank as the greatest metalliferous mining enterprises in Canada, have been built up without asking or receiving one single dollar from either the Dominion or Provincial Governments. Fifteen years ago when the members of the Canadian Copper Company pluckily invested their capital and commenced their pioneer work of development in the region, Sudbury was a barren and inhospitable wilderness. To-day, owing to mining, and entirely dependant upon it, it has grown to be a thriving and prosperous community having a population in excess of 6,000 people, well housed, having excellent churches and schools, a good electric lighting system, a well managed hospital, and a water works and drainage system equal to the demands of the people. 1500 persons, miners, mechanics, furnace men, laborers, teamsters, etc., find employment at the mines, and many more could be given work were they available. A further instance of the immense importance of this industry may be gathered from the heavy expenditures which are made by the mines in wages, for Canadian mining machinery, for supplies purchased from Ontario merchants, for Canadian coke, for freights on Canadian railways. One company alone has expended no less than $2,774,000 for wages and nearly $5,000,000 for machinery and supplies. Last year the wage bill of one of the companies amounted to $521,000, and $526,000 were distributed in machinery and supplies.

Legislation such as that proposed by the Mines Act would close up these mines.

That the impression created by those fostering this agitation that Ontario has a monopoly of the nickel, or a practical monopoly of the nickel supply of the world, or even of the American continent, is entirely false.

In support of this statement, we submit the following official figures of the quantities of nickel ore produced by New Caledonia and by Canada and the United States during the years 1889-1899:—

Year.	New Caledonia.		United States & Canada.	
1889	Metric Tons	1,050	Metric Tons	409
1890	"	1,200	"	750
1891	"	1,900	"	2,160
1892	"	950	"	1,950
1893	"	1,600	"	1,800
1894	"	1,900	"	2,250
1895	"	1,850	"	1,800
1896	"	2,707	"	1,700
1897	"	2,858	"	1,900
1898	"	3,648	"	3,250
1899	"	3,700	"	3,650
	Total	23,363	Total	21,619

It will be observed that during these eleven years New Caledonia produced 23,363 tons of nickel, while Canada and the United States produced 21,619 tons. From 1889 to 1900 the price of nickel declined from 48½c. per pound to 27c. per pound in Europe.

The growth of the nickel mining industry of New Caledonia, and the grave importance its competition to Canadian nickel ores in the American market is assuming, may be judged from the fact that on the first of this month the steamer Menantic arrived at New York from Port Morie, New Caledonia, with a cargo of 3,602 tons of New Caledonian ore, and another steamer is expected from there with an equally large cargo about the 25th inst., both for the Orford Copper Company at Constable's Hook, New Jersey.

The proposed taxation, if collected, would force New York refiners to invest in New Caledonia nickel mines, while the Canadian producers of nickel, having no market in Canada, would be forced into bankruptcy.

That the tax contemplated by the Act is in excess of its entire value is clearly shown by the fact that according to the official report of the Bureau of Mines covering operations during the year 1898 there were 121,924 tons of nickel and copper ore smelted and 21,101 tons of matte produced. The value of this matte is quoted at $782,300. Now the tax proposed is $50 per ton of matte, which applied on 21,101 tons of matte would amount to $1,055,150, *this being greater than the total value of the product by $272,700;* and when it is considered that in addition to this there were paid in wages alone, according to the Mines Report, $315,501 to say nothing of the expenditures in plant, supplies, and freights, it will be seen that the copper and nickel smelters of Ontario would be asked to pay in excess of $588,201 out of their capital, or from whatever source they could obtain it, for the privilege of being permitted to carry on their business within the Province.

It is stated by these agitators that at present Canada is receiving less than 28 per cent. of the metal contents of the ore mined at Sudbury. This is wholly untrue. From authentic information in our possession, we can state that during 1900 there were produced in the Sudbury district alone 21,518 tons of copper nickel matte, and that in this production about $1,050,000 were paid for Canadian labour and supplies, this being 72 per cent. of the selling price of these metals. Further, it is well known that important concentrating works are now being erected at Copper Cliff, whereby the matte will be increased from 85 to 90 per cent. of its market value. These important works are expected to be in operation by the 1st of May this year.

That only a small portion of the nickel mined in Canada is used in the production of nickel-steel. During the first six months of last year out of 3,102,064 lbs. refined only 626,487 lbs. were used in the manufacture of nickel-steel in the United States.

Notwithstanding much jingo talk and profuse contributions to the Toronto *Globe*, the experiments by the Hamilton people have utterly failed to show that they can refine nickel on a commercial scale either by the Hoepfner or Frasch processes.

The question as to refining in Ontario depends upon two matters: first, the present state of the art of metallurgy and the nature of the processes necessary to refine Ontario ore; second, the extent of the market which the producers would have for the refined nickel when produced in Ontario.

There are only three known successful processes: first, that of Mr. Wharton, of Camden, N.J. His process is very complicated and expensive, so much so that he was entirely unable to become any large purchaser of the matte from Canadian works as produced and offered to him without any tax thereon. Secondly, that of Dr. Ludwig Mond. In regard to this nothing more need be said than that Dr. Mond, who has acquired by the expenditure of a large amount of money very extensive properties in Ontario, is absolutely opposed to the imposition of any such tax, and states quite frankly that it would result in absolute ruin to his project, and would prevent his being able to operate his Canadian property at all and compel him to obtain his ores elsewhere, and this on account of the fact that the coal and the acid which he uses in his process are very much more cheaply obtained in England and in Wales than in Canada—a very important matter with him; and secondly, that a very large part of his product being in the form of copper sulphate, for which there is a very limited market in Canada, the freight on this product to England, it being very bulky, would reduce his profits practically to the vanishing point; so much so, that not foreseeing any legislation of such a character as this by the Province, Dr. Mond, before investing capital in the purchase of Ontario properties, was at very great pains to satisfy himself that no export duty would be imposed by the Dominion Government upon his copper-nickel matte, and has several times, in the most unqualified way, stated that "if he had thought there was the slightest danger of the imposition of an export duty, or of such legislation as that contained in the sections of the Mines Act referred to, he would not have invested a dollar in Canadian properties." The tax proposed by the Ontario Government would be very much more restrictive and disastrous than any export duty at any time proposed or suggested on the part of the Dominion Government.

It must be further noted with regard to Dr. Mond's process, that so far as the copper is concerned the copper produced is not refined copper but copper sulphate. Therefore, he would not be able to obtain the benefit of section 10 of the Act, which would permit the Lieutenant-Governor-in-Council to remit the license fee. The matte at present produced has practically gone through all the processes which require the expenditure of a large amount of labor; in fact, over 85 per cent. of the total amount paid for labor under existing circumstances will be spent in Ontario. The refining to fine metal of all the ore, even if done within the Province, would give employment to less than 100 men.

The only other process in operation is that of the Orford Copper Company, which is in operation near New York. This process requires to its successful operation certain alkali chemicals which are obtained in the vicinity of its works as waste products from a certain chemical works there. Furthermore, this product requires repeated smelting (some six or eight times) with this alkali, which finally slags off all the copper and iron, leaving nickel combined with sulphur alone, from which the sulphur is then removed. In order that this process can be worked to commercial advantage it is necessary that the alkali referred to be obtained very cheaply, and large quantities of coal are required for the numerous smeltings. Both these products are very much cheaper in New York than in Canada. The waste alkali referred to is not produced in Canada except as a refined production, and the price is absolutely prohibitive. The large quantities of coal obtained costs $2 per ton in New York, and $4.90 per ton at Sudbury; but even if the coal and alkali could be obtained as cheaply, there is, nevertheless, the further matter which alone renders it possible for the Orford Copper Co. to refine Canadian matte to advantage—that the Orford Co. at New York has a large refinery of pure copper ores from various sources, and it is enabled to distribute the copper slag which comes from the refining of the Sudbury matte among its other furnaces, and so very cheaply and economically save copper slag. The copper produced by the Orford Copper Company from Sudbury mattes is only about one-tenth of its entire output of copper.

COAL MINING AND TRADE.

In all the coal mining districts of Canada there is an amount of development work going forward far in excess of anything previousiy known during the winter months, and it will not be the fault of the operators if there is a scarcity of fuel next season. In British Columbia the coast mines are working full time with an increased staff, and will be prepared to ship a larger tonnage next season than ever before. At the Fernie Mines the Managing Director, Mr. Rogers, states that over 10,000 feet of development work have been done during the last year, and assures the public that within a very short time the demand will be fully met. It is to be hoped this is a true prediction, as hitherto there has been a difficulty throughout the Kootenays in obtaining as much coal from these mines as was required At the present time the output is about 1100 tons per day from Coal Creek and 75 tons from Michel, but the latter mine is not turning out at all well as the coal contains a much higher percentage ash than that at Fernie, reaching as high as 15 per cent in the coke. Unless further development shows improved quality this opening may have to be abandoned, a course which has been adopted with all the openings hitherto made on this Creek some four or five in all. It is difficult to understand why the output has not by this time reached at least 3,000 tons a day. It is three years since operations were first commenced, and although naturally the difficulties of opening up during the first year, retarded production at its beginning, it is nearly two years since the output reached 700 tons a day, and a second and third year should have shown a gradually accelerated speed of development. In the interests of British Columbia smelters which are clamouring for coke, and West Kootenay consumers who are buying coal from Lethbridge it is to be hoped this state of things will soon be remedied.

The local press has several times taken up the question of the importation of alien labour at these mines, pointing out that it has not only had the effect of driving the Canadians from the town, but has been very disastrous for the trades people, and has worked against the interists of the community and the Province generally.

According to the latest report the Fernie mines now employ 40 per cent. of Poles, Slavs and Hungarians, and 10 per cent. of Dagos. Most of the former come from the lawless districts of Pennsylvania and are anything but desirable citizens. In point of education they are no better than the Chinamen, and as little able to comply with the requirements of the new Act, which makes it illegal to employ any miners who cannot read the Rules and Mines Regulation Act in English.

There is a further question of the safety of the workmen involved in the employment of this class of labour, and reports of accidents occasioned by their recklessness and ignorance are becoming common.

No doubt the labour question is a most difficult one, and in every coal mining district of Canada at present there is a great scarcity of suitable men, but in a case like the one under consideration, where the charter of the Coal Co. secures them a selling price which leaves such a large margin of profit they ought certainly to be able to offer such wages as would attract white labour. As was pointed out in the last issue of the REVIEW the Company's own experts estimated the cost of production at less than half the selling price fixed by the Government. This protection is one which no other mining company in Canada, or, so far as we know in the whole world, has ever received, and should certainly not have left it possible for any such abuse as the above to creep in.

In Eastern Canada all the coal mines are busily employed, so busily in fact that they have not yet been able to lie idle for the customary winter repairs to machinery and appliances. During the month of January the Dominion Coal Co. raised 170,000 tons of coal, a record breaker, and shipped 50,000 tons of this to the New England Gas and Coke Co. at Everett. All the other mines are busily employed in making up the deficiency which existed at the end of the ordinary season, and so scarce is coal in New Brunswick and Quebec that American bituminous coal is being freely sold at Montreal. It is laid down at $4.65, including freight and duty, an exceedingly low price when we remember that it has to be brought from Pennsylvania. At the close of the shipping season the Dominion Coal Co. reduced their price, but the collieries upon the mainland are selling at the same figure as in November last. This has led to a little complaining and the suggestion has been made that the Government onght to fix a limit to the selling price. Possibly those who made this suggestion had in mind what had been done in British Columbia, but the conditions are totally different, and there is no doubt it would be as great a mistake to adopt such a course as it was in the first instance to interfere in the case of the Crow's Nest Pass Coal Co. No doubt in that case the course adopted was one which at the time commended itself to the judgment of the Government and they believed that they were protecting the best interests of the Province, but in the short period which has elapsed since this Legislation, it has been made abundantly evident that competition would have resulted in giving the coal at a very much lower figure. A critic of the proposal has not inaptly remarked that if the Government fix the price of coal they should fix the rate of wages and the amount of profit, which is equivalent to saying that they should consent to eliminate the business element from the coal trade. The fluctuations in the price of Canadian coal have in the past been very slight and but for the abnormal demand of 1900, would probably have ranged not more than 50 cts. higher than the standard. With the number of mines now being opened in the Maritime Provinces it is certain that this matter will find its level in a very short time. It is interesting to observe the rapidity with which operations are being carried on by the Inverness and Richmond Collieries Ltd. in Cape Breton. The deeps are in 800 feet and the quality of the coal is improving; the per centage of ash and sulphur being less than near the outcrop. It is understood that if explorations now being made show a continuance of the coal seams to the north the railway is likely to be extended from Broad Cove to Cheticamp and a summer port established there; of course the bulk of the coal will be shipped from Port Hastings. Development at Port Hood is proceeding apace and shipments will commence carly next season. Meanwhile the only difficulty here as elsewhere is scarcity of labour.

Radical changes have already been made by the new mauagement at the mines of the Acadia Coal Co. The Macgregor pit, which for some years has been worked at heavy cost has been abandoned, and the miners turned into the slopes. This will reduce the cost per ton, but how the output of next season will be affected remains to be seen.

Boring operations are still proceeding by the aid of the Calyx drill, in the McVey coal areas, but it will be several months before the depth at which the Mullin's seam is expected to be found will be reached. A contemporary throws cold water on the project and suggests that the exploration is more a matter of academic interest than practical utility. If this surmise is correct the men who are supposed to be finding the money have developed a hitherto unsuspected streak of interest in "academic" subjects. So sound an authority as the late Richard Brown believed in the continuality of the Mullin's seam all through the back-lands and its probable identity with the Tracy. All the explorations of recent years tend to confirm this theory, and we believe it is not so much a matter of whether the Mullin's seam is there, as it is a question of quality and thickness. The only proof made in this seam of recent years was at Victoria in 1895, when 100 feet of heading was driven into it. The result was not altogether favourable, the coal being somewhat tender and carrying a high percentage of ash. As however the heading was driven in the outcrop and on the extreme limit of the seam towards Sydney Harbour, it could not be accepted as a fair criterion of the general character of the coal, and there is every reason to believe that at a depth of 250 feet to 300 feet in the neighbourhood of Cochrane Lake, a good, workable seam, quality equal to the Pbelan will be found. The important point as affecting its value depends upon whether the seam is split like the Tracy and divided by a band of shale, or whether it is one solid seam. If the seams are identical then the problem is how far from the MacLeod areas towards Sydney the split continues. There was no sign of it at Victoria, but south of that district nothing definite seems to be known. It is to be hoped the proof will be pushed to a conclusion, as it solves the problem of the existence of this seam not only under the back-lands but under all the Glace Bay areas of the Dominion Coal Co.

In conversation with Mr. Hiram Dunkin, the general manager, of the Dominion Coal Co., who was at Montreal during the month, we learned, that the large compressor plant supplied by Walker Bros, of Wigan, England, has been installed successfully at Dominion No. 4 colliery and is giving great satisfaction. This magnificent piece of machinery is greatly admired by the officials of the company and it is unquestionably one of the finest of the many large compressor plants which have been installed in Canada during the past year. Its size is: High pressure steam, 31 inch diam.; low pressure, 57 in.; high pressure air, 32 in.; low pressure 51, cylinder 5 ft. stroke, capacity 6,400 ft. of free air per minute at 80 lbs. pressure and 450 feet piston speed. The weight is about 150 gross tons. The fly wheel weighs 25 tons. These figures give an idea of the great size of this beautiful compressor.

The following are the returns of the output and foreign shipments of the Vancouver Island collieries for the past year, the total shipments for 1900 showing an increase of over 142,000 tons over those of the previous year.

Output of the New Vancouver Coal Co. for 1900:—

	Tons.
January	47,493
February	47,128
March	52,163
April	47,881
May	50,674
June	52,265
July	44,025
August	44,817
September	67,023
October	53,376
November	51,686
December	51,400
Total	580,031

FOREIGN SHIPMENTS.

1900.	N.V.C.Co.	Dunsmuir.	
January	32,286	19 788	20,034
Feb uary	38.832	17,811	18,897
March	37.423	12,483	25,287
April	36.379	13,795	22,873
May	41.286	11,996	27 316
June	39.985	21,107	36,440
July	37.571	8,497	18,982
August	41,070	18,070	31,085
September	31,997	10,013	24,237
October	32.805	12,371	27,090
November	42,132	20,069	20,935
December	28,609	3 759	20,479
	440,375	169,759	293.755

	1899.	1900.
New V. C. Co	463,109	440.375
Wellington } Dunsmuir Collieries	206,422	7 811
Union } Dunsmuir Collieries	88,174	169.759
Extension } Dunsmuir Collieries	11,386	293,755
Total	769,094	911,700

W. B.

CORRESPONDENCE.

Railways and the Mineral Interest.—A Proposal for a Government Railway.

The Editor:—

A railway charter known to the people of the United States and Canada bears in some features a striking resemblance to the letters of marque issued in the days of good Queen Bess, differing however mainly in this that her privateers were never allowed privilege of piracy against the lives and fortunes of the English. We have changed all that. The railway promoter—or privateer let us say, for there is no distinction of character—with, for pilot, the cunning skill of a solicitor, gets from the legislatures franchises which authorize the taking from the public all that they will submit to for freights and tolls, and at the same time the privilege of exploiting municipalities for bonuses and the pockets of investors who are induced to buy bonds and preferred stocks. What are the results? Every industry suffers. The railway privateer passes on to Newport, Monte Carlo, or to "wintering in the Riviera."

This portrait of the railway privateer is not overdrawn. Its counterpart figures not only in Canadian history but in English history. A recent writer on Railway Nationalization tells us that "the financial jobbery incident to the mid-century railway promotions, stands out as one of the blackest spots in modern English history. Notorious swindlers exploited the credulity of the public to amass great fortunes out of perfectly bogus schemes. Mr. Herbert Spencer has probably written no stronger attack upon any abuse, than his scathing indictment of this phase of railway history. And it is a common fact that the opposition of the House of Lords to the London and Birmingham Railway was bought off by the promoters, who bribed several prominent inmates of the gilded chamber. Thus an hostile vote was reversed within a few days. It is true that several of the most glaring of these promotion abuses have passed away, and with the growth of the railway construction, opportunities for their practice on a large scale have also been removed, but many still prevail."

At length the railway privateer must give place to the General Manager, whose function is to get dividends from farmers, manufacturers, miners and the travelling public; to stoutly defend vested interests on the one hand against the laborer or mechanic who for running the machine asks a fair wage, on the other against the freighter who clamors that transportation rates shall be struck on some other principle than that they are "what the goods will bear."

No industry suffers so much from the oppression of the railway systems of Canada as that of mining. The high rates at all points on ores have never been favourable to the development of traffic, while the lack of terminal facilities for loading and unloading has added to the cost of transportation. Canadian railways have been proverbially slow, and have made their customers pay in proportion to the slow revolution of driving wheels. The usual rate of half-a-cent per ton per mile, with reductions for large quantities and great length of haul, has been utterly disregarded by railway managers, and instead one hears of one cent and a quarter to one cent and a half per ton per mile on iron ore between various points on Eastern Ontario railways. Without dump car for unloading or ore bins for loading facilities, these railways are not properly equipped for accommodating this traffic, and so, what with high freight rates and terminal charges, iron mining is a struggling industry. And yet there is no business which would pay the railways so well as this. Every dollar of freight from the mine ensures a large return business in goods for miners and mining supplies.

If Britons, reduced as Sir Alexander Milner reported by remediless grievances to the condition of helots and outlaws in an alien country were able to arouse the sympathies of Canadians to the highest pitch of popular indignation, surely it is surprising that the same sort of sympathy has not been shown in any influential degree against the scale of railway rates in this country. In a series of articles on "Government Ownership of Railways" in recent issues of *The Canadian Magazine*, Mr. R. L. Richardson, M.P., has shown that the need which exists for the radical reform of discriminating rates is so great as to call for Governmental interference. But, it may be asked, will any indictment however strong have any influence upon Parliament unless backed up by indignation meetings in every business centre and petitions from every hamlet in the Dominion? Certainly not.

Let us turn from the serfdom under the railway machine which prevails in Canada, and from the unwillingness of our legislatures to apply a remedy, to our sister Colony of New Zealand, where the Government owns 2090 miles of railway, 177 miles being owned by other corporations. The revenue earned for the year ending 1st August, 1899, was 3.29 per cent. on capital cost. One item of revenue alone lets in a "flood of light" on the management of a railway in a country where "the public welfare is the supreme law" in comparison with railway management here where private interests are paramount and the public welfare subordinate thereto. The secret history of express traffic in Canada since Mr. Brydges divided with his friends the enormous profits of a contract between the company known as the Canada Express Company, in which he was a secret partner, and the Grand Trunk Railway of which he was General Manager, down to this time when the Dominion Express Company enjoys the special patronage of the Canadian Pacific Railway Company for the private benefit of the fortunate ones who own its stock, would be best interpreted by an English law lord gifted like the late Lord Chief Justice Russell with the power of expressing moral distinctions in clear and concise English. The Canadian public whose traffic has been tolled beyond the ordinary railway charge, the amount necessary to give the owners of Express Stock enormous dividends, stand befooled in the eyes of New Zealanders, whose Government derives a largely increasing revenue from the carriage of parcels, concerning which the Minister of Railways remarks:—

"The new parcels scale of charges came into force on the 1st April, 1897, since which date nothing has been more encouraging than the remarkable increase in the parcels business, the increase in numbers for the past year being 58,379, and for the past two years, as compared with the two previous years, 175,029 in number and £14,470 in revenue. This indicates that a large and lucrative business may be cultivated in this direction, and at the same time the producer and consumer may be brought into more direct communication, to the benefit of each other." And he announces that along with a reduction of 20

per cent. in rates on agricultural produce in general, and 40 per cent. on cheese and butter, "it is also intended to introduce a new and reduced scale of rates for small lots of goods of 28 lbs. weight and upwards, with a view to encouraging by means of low freights the forwarding of small lots of goods."

Not only is the traffic of New Zealand carried mainly on "light" railways, 556 miles having 40 lbs. track and 64 miles 30 lbs. track, but the conditions of traffic are as opposed as they can well be conceived to those economics of railway traffic which distinguish this country and by comparison give our railway systems incomparably greater advantages for revenue. The Hon. Mr. Cadman, in his report as Minisister of Railways, thus concisely points out the conditions which render New Zealand railways "costly to maintain and difficult to administer in an economical manner":—

"In the first place, the long-distance-transit business in New Zealand is carried on by ocean vessels and the Union Steamship Company, the railways really acting as feeders for the vessels which load and discharge at the numerous ports all along our extensive seaboard. Unlike most other systems, there is no one centre in New Zealand upon which all the railways converge, and from which they can be easily and economically controlled. The New Zealand railways consist of numerous disconnected systems, costly to maintain and difficult to administer in an economical manner. Time will doubtless rectify this, and each island will eventually have its system of railways with unbroken connections throughout. No comparison can be made with the business and working results of our railways as compared with, for instance, the State railways of Victoria or New South Wales, each of which have one unbroken connected system, terminating in the one case at Melbourne and in the other at Sydney. Such systems command the business of distant places, thereby securing a lucrative revenue, a class of business, as I have before indicated, almost entirely carried on by sea in New Zealand."

The expansion of railway traffic plainly calls for expenditures for increased facilities respecting which the same Minister remarks:—"It cannot be expected that existing facilities can successfully cope with a business increasing in such a remarkable manner, and which expansion, in view of the energy of the people, the fortunate results following upon the cutting-up of large estates for closer settlement, the increased production of gold, and cheap money, is, as far as I can see, likely to continue for some time to come."

The success of light railways in New Zealand and in Norway and Sweden supports the claim that, for a large part of the region yet remaining in this country to be opened to settlement they are eminently suitable. Take for illustration a proposal to construct a narrow gauge line from Lake St. John under the northern slope of the height of land looking to St. James' Bay, thence to Prince Albert, N.W.T., and thence to the valley of the Mackenzie River and the most northern mission on its banks or to the Arctic Sea. What square leagues of forest, tracts of fertile land like that on Lake St. John, mineral zones, rich in gold, iron, petroleum, coal, and fisheries would afford homes to millions from Northern Europe whose energies would be a constant demand upon our manufacturers and merchants.

The Dominion Government might well undertake such a work, and at the same time enter upon a new path in prison reform by employing as railroad navvies some 1200 inmates of penitentaries. The system of imprisonment for crime is radically wrong in the judgment of most penologists. The criminal is employed on works within prison into which no element of profit enters, or he is exploited for the benefit of some contractor and denied any wage for his labor. In both cases he is put outside of all industrial relations to the community, and dealt with on the very footing of a slave. On the other hand if given the opportunity to earn a home, and the while protected from strong drink, the criminal who now returns to society only to be scorned and tempted to another fall, would become a useful citizen either as a farmer, a railway laborer, miner or fisherman. The work of penal colonies along the line of construction would probably advance the railway with sufficient rapidity. Before many years would pass Canada would have its own railway to the great icy sea, with probably a branch to the Yukon on the West and Chesterfield Inlet on the east, operated by a body of reformed men now condemned to the pernicious methods of the penitentiary system.

Who doubts that such a work, backed by a moral purpose, and carried out with efficiency and economy, would do more to prosperously colonize large numbers of the North European races in habitats suited to their thrift and industry, than any land jobbing schemes of the money-grubbers who now prey like harpies on the public domain and the labor of the poor?

J. B.

Kingston, Ont., 15th Feb., 1901.

A Simple and Convenient Instrument for Mine Surveys.

By Frank Robbins, Mining Engineer, North Star Mines, British Columbia.

[Paper to be read before the March meetings of the Canadian Mining Ins itute.]

The excellent paper of Dunbar Scott and the very thorough discussions of the same in the transactions of The American Institute of Mining Engineers for 98-99 make it almost a work of superorogation to write anything upon the subject. However the title of that paper "The Evolution of Mine Surveying Instruments" seems to lead the subject up to "perfection" while the title of this paper indicates—at least I intend it to—a simplicity of construction tending rather to "Involution." It may be well to say however that no one more keenly appreciates accurate under-ground surveys and perfect mine plans than the writer; and none is more inclined to condemn loose and inexact work in this direction.

The experience of all of us no doubt—particularly in mine examinations—tends to show that many mines, especially those which are for sale or are in urgent need of examination, have no plans at all; and in cases where plans exist they are frequently found not posted up to date. It may be taken as an axiom that a perfect report can not be made without a plan, that is, of course, unless it be something that can be condemned at a glance and summed up with a terse "No good." This plan must be something to show where samples are taken; where pay shoots begin and where they end; the reference of one level to another and the hundred and one details which will occur to the engineer.

Let us assume an extreme case. A short option is held upon a mine or prospect, situated in a remote mining district of British Columbia, the mine is reached by a mountain trail from the nearest small settlement 25 miles away, it is 20 miles over a mountain road from the settlement to the nearest small town, from which it is 50 miles of staging to the railway. The clients in Montreal or Toronto have waited till the last minute before sending the engineer out—probably till the snows have set in—and they are now anxiously waiting for the report.

The mine is reached and it is found that the values are variable, lie in a rather flat vein, and consist of more or less irregular shoots or bodies, these have been opened up by several levels, all as crooked as a ram's horn, there are two or three faults, and the owners have no map of the workings. While the engineer is getting warm an indian messenger comes in with a wire from Montreal or Toronto telling him that it is important that he hurry his report. A plan is essential, there is no time for an accurate survey with careful closing points. What is wanted is something more than a sketch and something less than the perfectly constructed plan of a colliery properly conducted. How often do

engineers stumble upon just such cases as this? In my practice I find that they are the rule. Perhaps not in British Columbia where the mine plans are kept up as carefully as the recollection of the catechism.

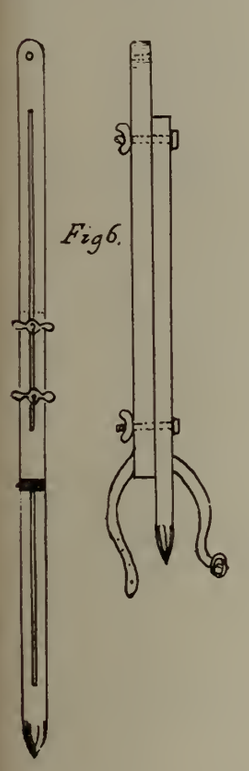
Some sort of a sketch plan may be prepared with the aid of a pocket compass. I have tried this with an old fashioned mahogony box compass held in my note book, the sides of the book being used as sights—the needle never settled—I have tried it with a prismatic compass; but my points were never certain. I have carried a heavy transit along on such trips, nursing it carefully, in case of emergency; almost invariably in such case to find the mine perfectly provided with plans.

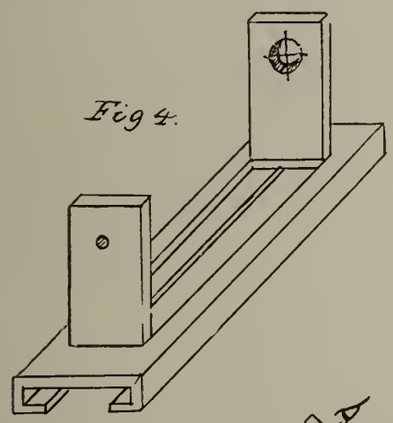
In the light of such experiences I hit upon the "simple and convenient instrument" which gives the title to this paper, with the aid of the accompanying cuts I will endeavour to describe it.

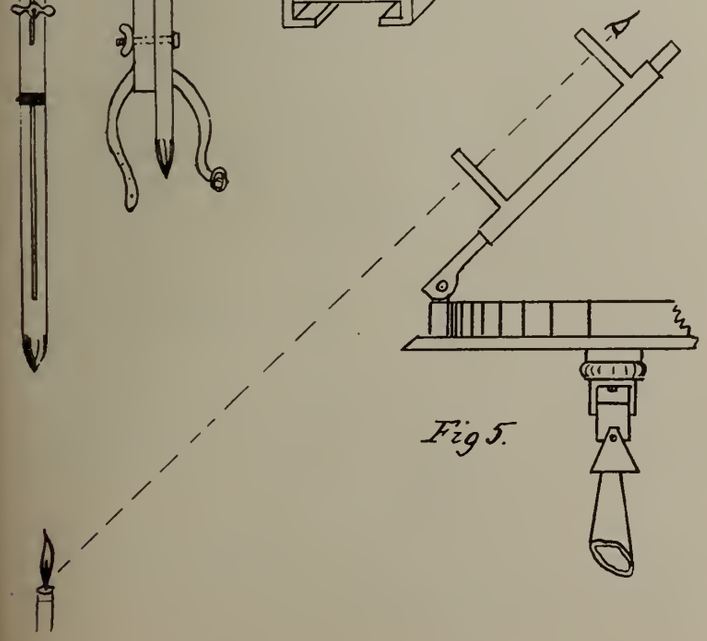
First I will assume that a compass which may be read to half a degree will come within the bounds of accuracy required. That, when local attraction is manifest, back and fore sights will be taken at every station and the included angle between them read, after the "old country" fashion of "blind dialing." Where attraction does not exist the instrument to be set up at alternate stations, only, and the middle station established by fore and back sights as in the ordinary compass practice. That the bottom plate of the dial have a semi-circle divided thereon, and graduated both ways from the E or W point from O to 90 degrees, with a pendulum indicator suspended from the centre pin traversing this semi-circle by which angles of elevation and depression may be taken when the dial is set in a vertical plane.

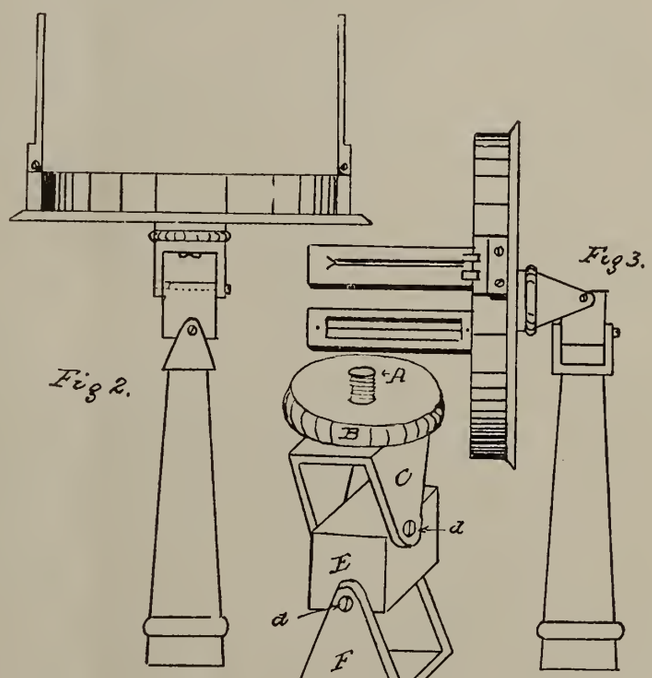
Many years ago I came into the possession of a pocket compass, made by Gurley of Troy, N.Y, this consisted of a flat square plate about 5 inches square upon which was set a compass dial with the above pendulum attachment for vertical readings, this compass was provided with two folding sights. It was a good pocket compass. By laying the edge of the square plate upon a wall or upon a ladder I could read slope angles. By levelling it upon a few rocks and lying down upon my stomach in a wet drift I could get a bearing through the two sights with a fair degree of accuracy. By holding it in my hands and averaging the run of the needle through its oscillations I could also usually guess a bearing somewhere within 5 degrees. It struck me that this instrument was susceptible of improvement and that a light tripod to which the compass could be attached would prove a convenience. The tripod was easy enough, the attachment however had to be considered. The ordinary ball and socket joint was the first suggestion; but while this would admit of reading the needle to perfection it would not admit of the taking of readings in the vertical—a *sine qua non* in all mining instruments, I take it. I happened about this time to run across in an old book of mechanical movements the cut of an universal joint—*Goyjot's Joint*, it was called, if my memory serves me—which I thought would do. This consisted of a square block of metal with a bended plate on top and another underneath, these plates being attached to the block by screws running through the latter, one above the centre and one below it and at right angles to each other, thus admitting of the plate "C" passing through a semi-circular arc at right angles to the axis of the upper screw "d". The block "E" has also a range of movement in arc at right angles to that of "C" and around its pivot, the lower screw "d". I made such a joint of wood and sheet brass and saw that that it would answer the purpose. I sent this pattern to John Roach—the old instrument maker of San Francisco—who made for me the joint shown in Fig. 1.

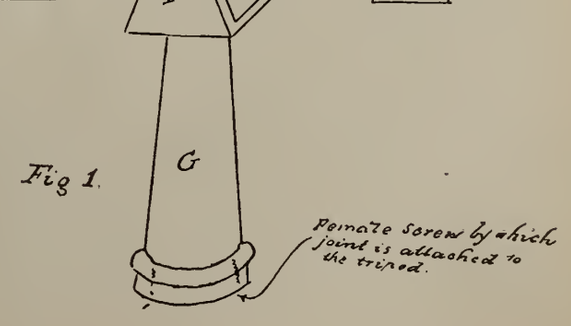
A disc is centered and braced to the bottom of the compass; into











this disc a female screw is tapped. "A" shows a male screw corresponding to this and by which the compass and milled headed disc "B" are attached to each other. "B" is attached but not fixed to the bent plate "C" by means of another screw passing through a hole in "C", and threaded into "B". Thus "B" with the compass attached may be turned in any direction upon the surface of "C". See Fig. 2.

The bent plate "C" is attached to the block "E" by screw "d" passing through "E" but not fixed to it. The tension of the screw is sufficient to hold "C" in any position of its range of movement The bent plate "F" is attached to the block "E" in the same way and "E" has a range of movement at right angles to that of "C". The bent plate "F" is fixed to the hollow spindle "G" which is screwed to the solid spindle of a simple tripod. It will be evident from Figs. 2 and 3 that not only can the instrument be leveled for horizontal observation; but it can also be turned into a truly vertical plane for dip readings with its pendulum clinometer.

In the position shown in Fig. 3 it is evident that an off-set (equal to the distance from the point of sight—usually taken at the end of the sights near the compass box—to the center of the top of the block "E") is made between the positions of the instrument in horizontal and vertical sights. The compass center being coincident with the center of block "E" when the instrument is set for horizontal reading. Correction may be made for this off-set, practically the same as for transits with parallel telescopes; but the error is so small that, with the limitations of the instrument, it may be disregarded.

With the above described joint and a light tripod it will be seen that I now had an instrument which was stable and by which I could take angles of elevation and depression and also horizontal ones within the range of sight possible between the top and bottom of the two folding sights, in fact in this last respect having the same range of service as the land surveyor's plain compass. But as bearings have to be taken down steep inclines something further was necessary. This was hit upon in the expedient shown in Fig. 4 and consists of a pair of sights with a peep hole in one and a round opening with cross-hairs in the other; the construction of this admits of sliding it either way upon either of the folding sights of the compass—usually over the open or fore sight.

With this attachment in place it is possible by raising or lowering the folding sight to which it is attached to look down any depression or up any elevation.

Fig. 5 shows the application of this attachment to a sight down an incline.

In practice it is usual to take the bearing of the incline first and to establish the point, if under-ground, by a candle; the instrument is then turned over as in Fig. 3 and the angle of dip taken to the same candle, and this recorded, with, or without, the correction for the difference between the centers of the instrument in the two positions.

When the instrument is in use the slide sight is usually left attached to it, when not, it is detached and dropped into the pocket. In fact the whole instrument—with exception of the tripod, and even that with the legs off, can easily be accommodated in an ordinary coat pocket.

Knocking about in out of the way places and packing one's belongings on horse or mule back every ounce counts and every cubic inch becomes an encumberance, hence a tripod between four and five feet in length does not add to the comfort of a trip. As the legs of the one for this little compass were light they could be easily replaced; so I took to leaving them behind, depending upon the country and a jack-knife to furnish a new set, but, sometimes, "hitting the high places" straight sticks were not easily obtainable and I came to the conclusion that some kind of light extension tripod was a thing to be desired. A mine carpenter and a mine blacksmith between them constructed the device shown in Fig. 6 and it has proved a useful tool ever since and has never been obtrusive in the pack. It is not material whether the lower part of a tripod leg slides into the upper, as is usual, or lies along side as it does in this.

The construction is as follows: A strip of hard wood about an inch wide (depending upon the sockets of the tripod head) and an inch and a half deep, a trifle shorter than the ordinary tripod leg, is cut in two. Each half is then ripped through the major part of its length, say to within three inches of each end; the slit is enlarged to about 3/16 of an inch, it is on the deep side and as accurately as possible in the middle of this. The two pieces are of equal rectangular section, that is they do not taper, except the lower one which at the end is trimmed to a point and tipped with iron. Two brass screws with square heads and thumb-screws are fitted to each pair of pieces. These screws couple each pair together through the long slot and by means of them the tripod legs can be extended to their full length for use or reduced to the length of a roll of blankets.

I have had the simple instrument above described in use now for a good many years and it is still in perfect condition. The attachment of the bent plates C and "F" to the block E by the screws d appear to be the only weak point; but these parts have not worked loose and the screws have always preserved the necessary tension to keep the surfaces in sufficiently close contact for the purpose required.

The only improvement which suggests itself is that a larger compass could be substituted for the small one I use and that it have levels which mine has not. Such an instrument as Gurley describes as a "pocket Vernier compass with 3½ inch needle" would be admirable if the pendulum clinometer were added to it.

With such an instrument as this in such a case as I have cited the traverse could be run and the notes platted and the examination probably finished in less time than it would take to send word to the railway that a transit was needed; and for the purposes of the examination and report the plan would be quite as good as one made to minutes by a careful man with a high class mining transit.

Notes on the Magnetic Iron Sand of the North Shore of the St. Lawrence.

By J. Obalski, M.E., .Quebec.

[Paper to be read before the March meetings of the Canadian Mining Institute]

Those deposits have always been known, and forty years ago they called largely the attention of business men as being a source of iron ore of the best quality and of the highest grade.

In 1867, a company called the "Moisic Iron Co." was organized in Montreal; the president was Mr. W. M. Molson, and amongst the directors there were the Hon. L. Letellier, Hon. R. Laflamme, and L. Labreche Viger, M.P. This company bought large tracts of land in the vicinity of Moisic, built on the spot eight bloomary furnaces, using the magnetic sand as ore, and charcoal as fuel. The product of these furnaces was sent to the United States, or used in Montreal at a roiling mill controlled by the company.

Nevertheless, the chief market was in the States, where the product of the furnaces was shipped, submitted to the duty of pig iron, say, 7 per cent. per ton.

In March, 1875, under the protest of the American iron workers, it was declared subject to the duty on bar iron, say 1½ cents per lb,, or 34.80 per cent. per ton, which compelled the company to shut down the work, and to go into liquidation, owing to the absence at that time of a sufficient Canadian market.

In August, 1868, when Dr. Sterry Hunt visited Moisic, out of the eight furnaces built, there were four in operation, giving a total of three tons of iron for 24 hours with 12 men, using 1400 bushels of charcoal, say 466 bushels per ton of iron.

The concentration of the ore was then made by Dr. H. Larue's process, consisting in magnets under which an endless table passes with the sand on it. The magnetic portion was attracted, but there was a fine clothing under the magnet, and by moving it down, the iron sand was put loose and dropped in an adapted receiver. It is said that one ton of pure ore was obtained, out of 2 or 3 of sand per day for each machine.

Several process have since then been suggested for agglomerating the magnetic sand, and in the elaborated report of Dr. T. Sterry Hunt, published in 1866-1869, vol. of the Geological Survey, and in which I have largely taken information for this paper, I remark the name of Mr. R. G. Leckie as the patentee of a process for using that sand properly reduced in connection with the manufacturing of steel by the Martin-Semmens process.

Mr. Labrecque Viger was also the inventor of a process to manufacture directly steel from that ore.

But since the abandonment of this industry, no other attempt has been made, and that immense quantity of iron ore is still there, waiting for the skill and energy of some enterprising concern to be utilized.

A company, called "the Natashquan Magnetic Iron Co." shipped from that place some quantity to England, for trial. I heard that the ore was successfully smelted then, but no practical result was obtained, probably on account of the difficulty of shipment.

Now, after that little historical sketch, I come to the study of the deposits themselves.

I copy again the following analysis from the report of Dr. Sterry Hunt (Geological Survey 1866-1869).

The black sand contains grains of quartz, garnets, and other hard

SKETCH SHOWING THE LOCATIONS OF THE BLACK SAND DEPOSITS

SCALE : 100 MILES TO AN INCH

minerals, besides of magnetite and titanic iron. I never found a trace of gold, although itis claimed that there is some.

	MOISIC.			BETSIAMITS.		MINGAN.	
	1	2	3	4	5	6	7
Protoxide of Iron.....	70.10		56.38		24.66		46.31
Peroxide of Iron.....	"	92.68		92.44		86.92	
		"	"	"	22.24	"	"
Titanic Acid.....	16.00	4 15	28.95	3.40	26.95	6.50	31.60
Oxide of Manganese..	"	0.40	1.10	undeterm.	1.10	0.52	1.35
Lime.....	"	0.90	0.95	traces	1.12	0.75	1.06
Magnesia.....	"	"	"	"	0.72	0.70	0.50
Insoluble.....	5.92	1.95	8.75	3.85	23.80	4.20	15.50
	92.02	100.08	96.13	99.67	100.59	99.59	96.32
Metallic Iron.....	55.23	66.73	43.85	66.56	34.94	65.58	36.00

Analysis No. 1 was that of the raw sand, 2, 4 and 6, of the magnetic portions, and 3, 5 and 7, of the non-magnetic.

It will be remarked that all the iron is indicated in the state of protoxide in the analysis of the raw ore or of the non-magnetic portion, on account of the difficulty of determining the degree of oxydation of the iron in the titanic mineral, which explains why the totals of the analysis are so much below 100.

The two next analysis were made in Belgium, in the laboratories of metallurgical companies:

Protoxide of Iron.....	28.04
Peroxide of Iron.....	71.07
Sulphur and Phosphorus.....	00.00
Equivalent to metallic iron.....	70.56
Oxide (magnetic).....	91.719
Insoluble silicates.....	1.082
Alumina.....	3.340
Lime.....	2.750
Magnesia.....	0.389
Sulphur.....	0.099
Phosphorus.....	traces
	99.379
Metallic Iron.....	71.337
Phosphorus.....	traces
Sulphur.....	0.039

Analysis of Moisic pure sand, by Professor Stillman, of Stevens Institute, Hoboken, N.J.:

Oxide of Iron.....	96.67
Phosphorus.....	0.03
Sulphur.....	traces
Manganese.....	0.33
Titanium.....	0.00
Insoluble matter (silicate of Alumina).....	2.88
Undetermined.....	0.09
	100.00

Equivalent to 70.01 of metallic Iron.

ANALYSIS OF NATASHQUAN ORE.

	1	2
Metallic Iron.....	70.31	71.94
Silica.....	.68	.22
Sulphur.....	.014	.026
Phosphorus.....	.043	.030
Titanium.....	.370	.420
	3	4
Metallic Iron.....	69.780	69.68
Phosphorus.....	.015	.005
Sulphur.....	.011	.021
Titanium.....	.860	.000
Silica.....	.321	

Those analysis made recently have been communicated by Mr. R. T. Hopper from concentrated ore obtained with a special machine of which he has the control. They show that he practically got rid of the titanium. Mr. Hopper has made important prospects and experiments on the black sand, specially on the ore of Natashquan.

By 1865, there were many applications for land on the Coast, and the Quebec Government had a few townships partly surveyed, and many lots sold for mining purposes.

Since that time, there was nothing done, but for a couple of years, some prospects have been made, and we have received many inquiries regarding the black sand. Eighteen months ago, I made a personal visit to the Coast, from Sheldrake to Natashquan, with the result that I was very favorably impressed by the magnitude of those deposits. It must be remarked that the sand does not occur all along the coast, but only in several places, the most important being Natashquan, Moisic and St. Jean.

I have not visited the Moisic deposit, but from several reports I have in hands, I understand that the quantity of black sand is large, and extends for quite a distance east of Moisic river. The nearest harbor is the Seven Islands bay, 16 miles from Moisic.

I give below my impression on the deposit I personally visited.

The beach sand has been produced by the disaggregation of ferruginous rocks of the Laurentian formation including anorthosites, against which the sea has broken during geological periods of indetermined length, and the matter so produced has been subjected to a natural concentration slightly different from that which occurs in an ordinary stream. The waves lift both the heavy and the light elements, but when they recede, they carry away chiefly the light elements, leaving the heavy ones on the beach; this operation repeated a great many times, causes deposits of greater of less thickness according to the strength of the waves. The wind also produces its effect by covering up the heavy deposits with layers of lighter sand. All these facts may be ascertained when a hole is dug in the beach, and the different layers of varying thicknesses and with varying percentages of metal are examined. Nevertheless, these deposits are chiefly observed about the low points, denuded of rocks, and their number is limited. It is very probable that the sea level has been lowered, and that, as the same phenomena occurred formerly, similar deposits may be found in the low-lying spots at a certain distance from the present sea-shore. This fact seems to have been ascertained by explorers and surveyors, and in the reports of the Department of Crown Lands and of Mines for 1899, a few facts are recorded regarding this point.

Dock Bay.—Immediately above the fishing station known as "Dock Bay," between Thunder and Jupitagan rivers, a little black sand is found in the bay, on a length of 500 feet and a width of 30 feet. On a point where the shore has been eaten away by the sea, there is a thickness of 10 inches surmounted by 5 inches of yellow ochre.

St. John River.—This deposit extends from the mouth of that river for a distance of 6 miles to the North East, but the greatest development is in sight at Pointe Noire, 4 miles from the river St. John. The black sand is visible on the surface in beds more or less rich, with a thickness varying from 2 or 3 inches to 10 inches. I measured the beach from low water mark to 100 and 300 feet where there is an intricate growth of small spruce trees making it difficult to see anything; but this soil may also contain ore. The river St. John can be entered only at high water and by small schooners.

From Pointe Noire to Mingan river, the shore is flat and the sand is also mixed with black sand. I did not find a great abundance of it, but as the action of the sea alters the look of those beaches, according as the black sand is more or less on the surface, it is possible that there may be enough to work at or at least that by prospecting a little inland, it may be found in greater quantities.

The nearest deep water harbor is Mingan, but the river St. John could be used for loading small schooners or barges which could be towed to Mingan (12 miles), for supplying large vessels.

Continuing along the coast, I found but little black sand, the shore being generally rocky. At Esquimaux Point, the beach is sandy, but I did not find it in workable quantities.

Great Natashquan River.—From the mouth of the river towards the East, for a distance estimated at 20 miles, there is in sight between the low water mark and the timbered ground, a stripe of sand formed by the flat beach from 100 to 400 feet wide, and of dunes ranging from 5 to 50 feet in height, and extending backwards 600 feet from low water mark. The black sand is distributed all through that area in alternate layers of varying thickness, going from 1 inch to 2 feet with a practical yield of black sand from 20 to 95 per cent.

I have measured sections of the dunes which for 15 and 20 feet in height would give from 40 to 60 per cent. of black sand as an average. It can be seen also on the East shore of the Natashquan river itself.

It is said that it continues as far as Kaghaska river and is found in this bay and the Musquarro.

The average proportion of black sand may be considered as 40 per cent., the quantity of pure magnetic iron being 25 per cent., containing from 68 to 70 per cent. of magnetic iron. I will remember that the theorical yield of this ore is 71.78 per cent.

Now, if we take an average depth of 20 feet, a width of 600 feet only, we will have, for each mile, over 1½ million of tons of pure ore of 68 to 70 per cent. of iron, taking 300 lbs. as the weight of a cubic foot of such ore.

The tonnage is considerably larger, as we take only 600 feet of beach to the line of trees.

This beach, as well as the others I have seen, is exposed to the sea, and there is no harbor in the immediate vicinity, the nearest being that of Little Natashquan, 4 miles to the west of Great Natashquan. This harbor is well protected, and could easily be made accessible to vessels of heavy burthen. It is surrounded by granitic hills and protected towards the sea by islets of the same rock.

On the Great Natashquan, 12 miles from the sea, is the first fall, 30 or 40 feet high, which could supply the motive power for large mills, and it is followed by three other falls separated by intervals of from two to three miles.

According to the above, the beach deposits are generally in sight for several miles on low shores exposed to the opon sea and without harbors or shelter. Large vessels loading ore there would have to anchor at a rather considerable distance from the shore, and special flat-bottomed lighters of somewhat small dimensions would be required to convey the ore in sacks to the large vessels which would hardly be practicable. In the two principal instances where I made an inspection, I consider that it would be completely impracticable to ship the ore direct by sea from the spot whence it would be obtained. It would thus be necessary to seek for the nearest harbors, to have the sand concentrated and purified on the spot and the merchantable product conveyed by tramways to the point of shipment.

It will therefore be seen that the working of these deposits must be done on a large scale, and that it would require considerable capital for the manipulation of large quantities by mechanical process and for purifying and conveying the product to suitable harbors.

The working of the sand should be done by means of steam shovels feeding cylindrical driers, whence the ore would be taken to electro-magnetic separators, several systems whereof have been patented. When separated, the magnetic oxide would be loaded in small cars which, by means of tramways would convey the ore to the wharf where it would at once be loaded on the vessels or be kept in elevators. The motive power could be supplied by the water-power in these regions, and the fuel would consist of fire-wood cut in the neighborhood, or of Nova Scotia coal which could be landed there for $3 a ton at the most.

The season of working would extend from May to October, say six months.

Sufficient ordinary labor could be obtained there cheap, and moreover, the manipulation of the sand should, as far as possible, be effected by mechanical means.

As for the use of that ore, I think that the Iron and Steel Works at Sydney, C.B., could use part of it as a mixture, the distance from the deposit to Sydney harbor being between 3 and 400 miles, and the coaling steamers returning from Quebec could take it as a backward freight to Nova Scotia. The distance from Natashquan to Quebec is about 500 miles, and from Moisic, 300.

The three principal deposits on the North Shore are in the vicinity and to the east of the Moisic, St. John and Great Natashquan rivers, but there are also less important ones at Portneuf, at Jeremie Bay (west of Betsiamis river), at Manitou River, at Dock Bay and in the bays of Kaghaska and Musquarro.

It is also reported that thin layers of black sand on the North West arm of St. Augustin river for a distance of 30 miles.

Notes on Gold Milling Practice at the Athabasca Mine, Nelson, B.C.

By E. Nelson Fell, A.R.S.M., Nelson, B.C.

[Paper to be read before the March meetings of The Canadian Mining Institue.]

The following notes may prove of interest, not on account of any especial features introduced into our process, but on account of the peculiar character of the ore treated. A casual inspection of the ore on the floor of the breaker room would create the impression that the ore is not suitable for milling at all. The general features are a hard blueish quartz, containing a large proportion of sulphides of zinc, lead and iron, showing free gold only when the ore is of fair grade, say from $30.00 per ton upwards in gold values; and then usually closely associated with the lead and zinc sulphides. At times the entire ore body consists of solid sulphides, usually under these circumstances of either iron or zinc. We are not in the habit of making regular analyses of the ore, but in December we took a sample from the ore pulps of the mill runs of December 2nd to December 15th inclusive. The ore at this period was what we call medium to low grade, and its contents were as follows:—

Gold	1.35 ounces to the ton.
Silver	45 " "
Zinc	2.20 per cent.
Lead	1.60 "
Iron	10.70 "
Sulphur	6.00 "
Silica	68.80 "
Lime (Ca O)	1.90 "
Alumina ($Al_2 O_3$	6.00 "

In general the ore may be described as high grade, as the average gold contents recovered in the mill, during last year, was over one and one-half ounces per ton and during the month of June reached very nearly three ounces per ton. A peculiar feature of the ore, and one which no doubt materially assists recovery in the mill is the free gold which is found imbedded in the zinc and lead sulphides, in samples where no sign of quartz is visible. I have before me a remarkable sample of fine grained galena, one inch high, ¾ inch broad and ½ inch thick, which is pierced by a wedge of gold, shaped like an Indian arrow head, ¾ inch long, $\frac{3}{16}$ inch broad at the base and tapering to a point at the other end. The mill contains ten stamps, working in two batteries of five stamps each. The frame is of the front knee type. The battery posts are 12 x 25½ inches, the knee frames are 12 x 17 inches and the girts are 12 x 13½ inches. The whole is bolted together in the usual way and these dimensions seem to secure perfect

solidity. The cam shaft is of steel, 5¾ inches in diameter, fitted for Blanton cams. Ours are arranged in the order of drop 1, 3, 5, 2, 4, and while this plan does not seem suitable to our case, we are unable to experiment with any other style without a new cam shaft. I think it would be an improvement if, in sending out these shafts, the manufacturers should drill them for the wedges, so that the order of drop could be changed. We find that the pulp banks up around No. 1 stamp and this both impedes the action of this stamp and interferes with the amalgamation in this end of the mortar. With a view to overcoming this difficulty our practice is to give the end stamp about one-half inch more drop than the middle stamps. The cam shaft works in open boxes, a system which we have proved to be thoroughly satisfactory. The guides are individual guides of maple with the grain of the wood up and down. Each guide block is held together by two ⅜ inch bolts running across the grain of the wood, with head and nut countersunk. Each pair of guides is held in place by two ⅞ inch bolts running through the guide rail. A hard wood wedge is driven home between each end pair of guides and the battery posts, and secured by a bolt. These guides give excellent service, if care is taken to have the guide blocks thoroughly seasoned before fitting; the cost of renewal is very slight, and they have the inherent advantage of all sectional guides.

The cams and tappets are of steel; the latter are fitted with three keys; after 24 months wear we have not yet had occasion to turn one tappet, and the cams show no sign of wear; they work smoothly and consume practically no grease.

The stems are of steel and we have not yet, after twenty-six months use, had occasion to even turn one of these, which is eloquent testimony in favor of our style of guides. The bosses or heads are of cast iron, and the shoes and dies are of forged steel. We have tried various much recommended special compounds and have found none so satisfactory as the forged steel. They last longer, wear more evenly and can be safely used, if desired, down to a feather edge.

The stamp when new weighs 980 lbs. and the speed varies from 80 to 115 blows per minute according to the requirements of the time, with a drop of from five to eight inches.

Under these conditions the mill has made a good running record. We stop on the first day of each month to clean up the amalgam in the mortars, lace belts and so forth, which stoppages aggregated last year, eight days and seventeen hours, besides these delays we lost four days and twenty hours. Our motive power is entirely water; working under a head of 398 feet. We employ two impact wheels, one being a motor two feet in diameter, which operates the stamps, the rock breaker, the electric light plant and the cyanide plant, and the other being a twelve inch motor which operates the vanners only, and of which the speed is never changed.

The mortars were supplied by Messrs. Fraser & Chalmers and are described in their list as No. 50. The width of the mortar at the point of discharge is 14½ inches. The height from the top of the die (when new) to the bottom of the screen discharge is 6½ inches and the die is 6½ inches deep; when the die is worn out, the height of the discharge is as much as 11 or 11½ inches.

The screens are of the diagonal slot pattern, and our practice is to employ a 50-mesh screen when the dies are new, a 40-mesh screen after 30 days wear and a 30-mesh screen when the dies are wearing low. It is evident that a mortar arranged on these lines is not designed to attain high records of crushing, and the greatest tonnage which we have put through, was during the month of January, 1899, when we crushed 713 tons in 30 days, 7 hours, or 2⅓ tons per stamp per day. The pulp after passing over the plates is sized in a cone sizer and passes in grades of size to four Frue vanners; the first or coarsest grade passing over a four foot corrugated belt and the other three grades passing over six foot plain belts. The tailings from the vanners have, up to the present time, received no further treatment, but from this time forward will be treated in the cyanide plant.

Copper Plates.—These are arranged as follows:—

1 Back plate inside the mortar.....	10½ in.	x 51½ in.
1 Chock block plate inside the mortar.	3¾ in.	x 50 in.
1 Lip plate outside the mortar.....	8 in.	x 54 in.
1 Apron plate outside do	56 in.	x 120 in.

All are electroplated with 1½ ounces silver to the foot. The apron plate has a fall of 1½ inches to the foot and just sufficient water is kept flowing over it to keep the pulp from banking on the plate.

The practice is to dress the apron and the lip plates five times in each twenty-four hours, using as a cleansing solution a warm solution of dilute cyanide and sulphuric acid, the plates are brushed up with a hair scrubbing brush and smoothed off with whisk brooms, brushed across the plates. Fresh quick-silver is applied before the brushing process in quantity as may be necessary. In this way the plates are preserved beautifully soft and clean. The amalgam is removed every two days from the apron plates, a small piece of rubber being used as a scraper for this purpose. Every sixth day the screens are removed, the lip plates are cleaned of amalgam, and all of the trash and chips are cleaned out of the mortars; but the chock block plate, and the back plate inside the mortar, are only removed and cleaned at the general clean up on the first day of each month.

The amalgam is cleaned with fresh quick-silver and squeezed as dry as possible. In this condition the amalgam from the plates outside the mortars contains about 20 per cent. bullion and the amalgam from the plates inside the mortars from 30 to 45 per cent. bullion.

Assays.—At least four assays are made daily:—

1. Of the ore at the feeders.
2. Of the pulp as it leaves the last plate.
3. Of the tailings.
4. Of the concentrates.

The sample taken at the feeders cannot be considered a satisfactory sample, but averaged over a period of several days, the results are fairly good. For the year 1900:

The average of the feeder samples was	$44.38
do do tailings do	$8.71
The theoretical recovery was	$35.67
The actual do do	$33.66

Recovery.—The theory under which we have been working is that the gold should be given as early and as ample an opportunity as possible to amalgamate, and for this reason we have held to the use of as large plates inside the mortars as possible. For this reason, and in order to preserve the back plate intact, we do not alter the height of the chock block which carries the front inside plate, and in this way the level of discharge is always the same. In this way, there is very little tendency to scour the plates, excepting (to a limited extent) around stamp No. 1 where the pulp is banked up by the action of the stamps; and the change of screens, as aforesaid, offsets the increasing height of discharge which is produced by the wear of the dies. After the run of the month of June, we cleaned off the plates inside the mortars, 3,183 ounces of amalgam, which produced about 925 ounces of bullion or 64 per cent. of all the bullion recovered. During this month our percentage of recovery was 81 per cent. of the value of the ore. My opinion is, that our loss consists, almost entirely, in the sulphides; and that our loss in amalgamable gold is slight. From June until the end of the year, our percentage of recovery steadily fell to 77.6 per cent. in November, corresponding with the proportion of bullion and concentrates recovered.

Month.	Total amount recovered.	Percentage by value of Concentrates to Bullion.
June.....	81.0 p.c.	21.5 p.c.
July.....	80.7	24.0
August.....	79.6	29.2
September	79.4	27.8
October	78.4	29.7
November	77.6	38.7

In order to endeavor to ascertain what proportion of sulphides were being lost, we sampled and analysed our ore pulps during December, as afore described. During this period 230 tons of ore were milled producing 26.7 tons concentrates which when sampled assayed as follows:—

Gold	2.67 ounces per ton.
Silver	6.00 " "
Zinc	5 5 per cent.
Lead	4.8 "
Iron	34.3 "
Insoluble	17.6 "

If all the above figures are correct and 900 lbs. of ore should produce 100 lbs. concentrates, then

900 lbs. of ore should yield 900 x 2.2 p.c.=19 8 zinc (lbs.)
900 " " " 900 x 1.6 p.c.=14.4 lead "
900 " " " 900 x 10.7 p.c.=96.3 iron "

Actual results are

In zinc we recover 5.5 lbs. or loss of 74 p.c.
In lead " 4.8 " " 67 p.c.
In iron " 34.3 " " 65 p.c.

The absolute accuracy of these figures is open to question, but I am satisfied that the general tenor of them agrees with our results in practice and they point to a serious need of additional concentration facilities. Our experiments, however, with the cyanide process for the retreatment of our tailings, seemed to offer such excellent chances of success, that we decided to instal a plant of this description and did not further consider the improvement of our concentration plant.

Fineness of Bullion varied during last year from 682.5 to 747.5 with an average for the year of 725.3. The fineness seemed to vary as the quantity increased, the bigger the brick, the higher the grade. It also seems to vary inversely with the proportion of concentrates recovered.

The number of tons crushed during the year was 5,054, which produced 520 tons concentrates or 10.2 per cent. by weight of the ore. The actual recovery in bullion was $25.62 and in concentrates $8.03 per ton; of the values recovered the bullion supplied 76 p.c. and the concentrates 24 p.c. The value of the tailings was $3.71 per ton and the percentage of recovery was 79.4. The tailings have been impounded in a dam pending the completion of the cyanide plant.

Stain on the Plates.—An irridescent brass coloured stain constantly forms on the apron plates; I use the word stain because it is so thin, and in such a fine state of subdivision that when gathered up in water, its appearance is that of a dark coloured solution. Fresh quicksilver when applied to the plate covered with this stain instantly adheres, as readily as though the plate were bright, and it does not seem to interfere with amalgamation in any way. It is instantly removed with the first stroke of the brush, and when the brushing process is ended I have seen the stain reappear within fifteen seconds after the clean water has been turned on, before the attendant has time to release the first stamp. We have only made very slight investigation into the nature of this stain. Without more than suggesting that it has any connection with the above, I may here draw attention to the fact that while the iron sulphides are apparently entirely composed of common iron pyrites, FeS_2=sulphur 53.3 and iron 46.7 per cent.; yet in the analyses of our ores and concentrates, we seldom find more than from ½ to ¾ enough sulphur to satisfy the iron in the formula FeS_2, not to speak of the sulphur necessary to satisfy the zinc and the lead.

A curious feature of amalgamation was noted when the mill first started. Amalgam was formed on the front plates in remarkable quantities which when retorted produced an insignificant amount of retorted sponge.

During the first ten days of November, 1898, 1,755 ounces of amalgam (squeezed dry) produced 161.8 ounces of bullion or 9.1 per cent. This had been even more remarkable during October and the same feature continued during the following three months, after which it became normal.

Melting.—For melting the sponge we use a Braun gasoline furnace with one large burner. The size of the furnace is 10 inches in diameter and 12 inches high, measured inside.

We make bricks weighing from 400 to 500 ounces each. We use a flux as follows

Borax glass	100 grammes.
Bicarbonate soda	50 "
Glass	600 "

and stir to excess with an iron rod. After skimming the slag, the brick is poured and is found in the mould with a heavy layer of matte on top. This is removed and the brick remelted under the same conditions. This process insures clean bricks in our case. The matte and slag are saved and, after the product of six months has accumulated, it is retreated in the pot with with nitre and litharge, and the resultant lead is cupelled. The residues are again treated in a similar manner, which second process removes all the value except traces of silver.

Leaching Copper Ores by Sulphurous Acid.

By E. P. Jennings, Salt Lake City, Utah.

[Paper to be read before the March meetings of The Canadian Mining Institute.

The writer has had occasion in the course of his professional work to investigate a unique process of leaching copper ores by the use of sulphurous acid, which has been patented in the United States by James W. Neill, of Salt Lake City, Utah.

The process, while yet in the experimental stage, has a number of valuable features which will make it of interest to members having deposits of copper ore remote from transportation, fuel and fluxes.

The native oxides and carbonates of copper are readily soluble in sulphurous acid with the formation of cuprous sulphite ($Cu._2 S O_3$). This salt is insoluble in water, but soluble in water containing sulphurous acid from which the copper can be precipitated by driving off the excess of sulphurous acid by heat. The precipitate is cuprous sulphite ($Cu. S O_3$, $Cu._2 S O_3 + 2 H_2 O$) and contains 49.1% of copper. This salt is heavy, crystalline compound of a dark red color, which settles readily from the solution and can be washed by decantation, dried and reduced to metallic copper by fusing on the hearth of a reverberatory furnace.

The process is suitable both for sulphide and oxidized ores the former being first roasted to expel the sulphur and convert the copper compounds into oxides, as sulphurous acid does not attack sulphides.

The ideal ore is one carrying oxides or carbonates of copper in a silicious gangue; lime and magnesia are objectionable, as they dissolve in sulphurous acid and, while they do not materially interfere with the reactions, they consume a certain amount of sulphur and so increase the cost of the process.

In practice the ore is crushed to pass a 20-mesh screen, placed in covered tanks filled with water containing sulphurous acid and kept in a state of agitation by forcing a current of sulphurous acid from the gas generators through the solution; this brings each particle of ore in contact with the acid and also keeps the water saturated with sulphurous acid gas. All the copper will pass into solution in from one to four hours; depending on the physical condition of the ore.

The charge is now drawn into a settling tank, the sands allowed to settle for a few moments, when the solution, which carries more or less slimes, is decanted into a filter press that separates the solution from the slimes and forces it to the precipitating tank. The sands in the

tank and the slimes in the filter press are washed once with sulphurous acid, which is afterwards used in the treatment of the next charge.

The dissolving tanks are arranged in series, one above the other; the gas entering the lower one and passing through each one in turn, any excess being at last absorbed in a condensing tower.

The precipitating tank is supplied with a steam coil through which the exhaust steam from the crushing plant is passed, thus heating the solution and precipitating the copper as cupro-cuprous sulphite which settles rapidly to the bottom of the tank. The solution from this tank is run into another tank while still hot and freed from small amounts of copper that is in solution as sulphate by means of a little lime.

The precipitates are dried and smelted to fine copper.

The plant can be so arranged that nearly all the sulphurous acid except that combined with the copper can be saved and used again.

One pound of sulphur is required to convert four pounds of copper into sulphite, and another pound of sulphur will keep the cuprous sulphite in solution, but the greater part of this second pound of sulphur can be recovered. In practice about one pound of sulphur is required to treat three pounds of copper contained in the ore.

The sulphurous acid is produced either by burning pyrites or sulphur, the former can be obtained in most mining districts and the latter occurs in great beds in Utah. When the original ore is a sulphide, it will furnish, by roasting, ample sulphurous acid for its own treatment.

The advantages of the process over the sulphuric or hydrochloric acid method are: first, cost of the chemical is low; second, it is generated on the spot by the use of a very simple plant; third, a relatively small amount of the chemical is used; fourth, the copper is separated from the solution by heat alone; fifth, the copper produced is practically free from impurities.

Sulphurous acid produced by roasting pyrites is the cheapest chemical procurable in the western country and the plant is much simpler than that used in making sulphuric acid.

A unit of copper converted into cuprous sulphite requires but half the sulphur that would be required to convert it into cupric sulphate.

Cuprous sulphite is precipitated from the solution without the use of scrap iron, which is a great advantage in remote districts. In southern Utah for instance, scrap would cost from $40.00 to $50.00 per ton and from 21/2 to 31/2 pounds of iron ore required to precipitate one pound of copper from sulphuric acid solutions owing to the large amount of basic salts formed.

Sulphurous acid dissolves very small amounts of other metals that may be in the ore and the precipitated cupro-cuprous sulphite is practically pure and furnishes pure copper by a simple smelting operation.

In experiments made by the writer on ores of the Triassic Sandstone of Northern Arizona, 95% of the copper was extracted by leaching the ore for four hours, the ore was a mixture of blue and green carbonates with some oxide disseminated in sandstone; the grains of which were firmly cemented by a secondary deposition of silica making the rock harder to crush and much more difficult to leach than an open grained sandstone would have been, as the little particles of copper were coated with silica.

The experiments demonstrated the feasibility of the process with this kind of ore, and a plant will be erected in the near future for the treatment of the ores of the Coconino Plateau.

A company has been formed to re-open the Curran Mine at Mount Uniacke; there are a large number of leads so close together that they have to be worked together. In the old days of this mine, it was worked by an open cut 60 feet wide and over 100 feet deep, and it looked about as dangerous a place in which to work as can possibly be imagined. The old mill returns show about 2½ dwt. per ton free gold; with proper and economic management this should be made successful.

COMPANY NOTES.

Canadian Smelting Works.—We are officially informed of the following output from the Trail smelting works in 1900:—

	Ozs. Gold	Ozs. Silver	Lbs. Copper	Lbs. Lead
Quarter ending 31st. March	15,811	257,298	655,699	1,943,738
" " 30th. June	12,022	270,024	328,966	1,875,409
" " 30th. Sept.	5,555	229,443	616,144	1,873,645
" " 31st. Dec.	15,515	244,709	2,007,881	1,931,288
	48,903	1,001,474	3,608,690	7,624,080

Payne Consolidated.—The Secretary advises under date of 14th inst:—

Statement for Quarter ended December 31st, 1900.

Tons of Ore Shipped, 2,957.

Net Profit - - -	$120,668.07
Less Dividend paid Jan'y 15th,	78,000.00
Surplus, - -	$ 42,668.07

Pending further development and instalation of machinery at the mine, shipments of ore will be reduced.

Cariboo McKinney Mining and Milling:—At the annual meeting of the shareholders held at Toronto on the 5th inst. directors report showed a net profit on the year's operations amounting to $53.148 ozs. out of which there was paid to shareholders dividends amounting to the sum of $ 50,000. Owing to difficulties encountered in the working of the mines which entailed unusual expense, as explained in the report of the managing director, the profit arising from the Company's operations was not as large as expected. Upon recommendation of the Managing Director the Directors have determined to suspend for a brief period the payment of dividends and to apply the earnings to the development of the ore chutes with a view to a more economical working of the mine, believing that the result will fully justify this policy.

The services of Mr. Jos. P. Keane as Superintendent of the mine were lost to the Company during the early part of the year 1900. The Directors are pleased to state that during the present month they have again secured his services. (Signed) ROBERT JAFFRAY, PRESIDENT.

THE CARIBOO MCKINNEY MINING & MILLING COMPANY, LIMITED.

Statement of Account 31st. December, 1900.

Capital Stock		$1,250,000.00
Bullion		837,512.21
Rent		8,997.30
Profit and Loss		3,148.02
Mine and Water Rights	$1,118,054.77	
Mill Plant	25,710.96	
Hoisting & Compressor Plant	30,224.22	
Buildings	2,627.18	
Office Furniture	242.55	
Mine & Mill Supply, Labor Salaries	416,301.35	
Expense	26,575.50	
Mineral Tax	4,890.33	
Dividends	457,337.52	
Cash in Bank	15,693.15	
	$2,099,657 53	$2,099,657.53

PROFIT & LOSS ACCOUNT FOR YEAR ENDING 31ST. DECEMBER, 1900.

Revenue.

Bullion	$160,831.85	
Rent	1,676 97	
		$162,508.82

Expenditure.

Hoisting & Compressor Plant & Mining	$ 80,098.32	
Mill Plant and Milling	22,945.01	
Mineral Tax	1,754.42	
Expense	2,629.73	
Salaries	1,933.32	
	109,360.80	
Dividends	50,000.00	
Balance	3,148.02	
		$162,508.82

RECEIPTS & DISBURSEMENTS FOR THE YEAR ENDING 31ST. DECEMBER, 1900.

Receipts.

Cash in Bank 1st. January, 1900	$ 18,340.57	
Bullion	160,831.85	
Rent	1,676.97	
Mine and Water Rights	256.55	
		$181,105.94

Disbursements.

Hoisting & Compressor Plant & Mining	$ 83,064.91	
Mill Plant and Milling	24,527.01	
Building	55.40	
Expense	2,629.73	
Office Furniture	60.00	
Salaries and Directors' Fees	3,313.32	
Mineral Tax	1,754.42	
Dividends	50,000.00	
Cash in Bank 31st. December, 1900	15,693.15	
		$181,105.94

Sultana Mine of Canada, Limited.—The report of the directors of the Sultana Mine of Canada, Limited, from August 14th, 1899, to September 30th, 1900, presented at the meeting held in London on February 6th, states that, owing to the faulting of the main ore body between the 6th and 7th levels the anticipations with regard to the date of distribution of profits mentioned in the prospectus have not yet been realised. The mine manager's report, covering the period from August 14th, 1899, to December 22nd, 1900, will show what has been done with a view of picking up this main ore body, and that the prospects of success are distinctly favourable. The policy of the directors has been from the beginning to thoroughly develop the mine. In all, since the formation of the company up to September 30th, 1900, £19,633, has been spent on the mine. Since March 15th, 1900, the mill of 30 stamps has been worked one shift only for the purpose of making trial runs, and to procure funds to assist in this development, with the results shown in the profit and loss account, £5,937. Vigorous development work has been in progress at the south air shaft from which most of the gold won has been obtained. The directors have furnished the shareholders with copies of the mine manager's weekly reports, from which it would appear that towards the latter end of December some important discoveries at the 2nd level south air shaft were made. The following cablegram was received from the mine manager on the 14th inst.:—"South workings. Sinking shaft on high grade ore body, westerly stopes looking exceedingly well. Judging from indications it is my opinion that mine will be self-sustaining at the beginning of May. This cablegram and the weekly reports above mentioned lead the directors to believe that very shortly the mine will be on a self supporting basis, and before long making profits. The directors think it right to bring the following facts to the notice of the shareholders. The company took over the mine in August, 1899, from Mr. John Fraser Caldwell, the vendor, subject to an advance from the Imperial Bank of Canada, for £10,000, in respect of which the bank hold a mortgage over the mine. At the same time Mr. Caldwell deposited with the company as security for this charge 50,000 vendor shares. The bank has never communicated with the company, but the directors understand that they are desirous of having this mortgage paid off, and the directors have opened negotiations with the bank on the subject. Profit and loss account shows a debit balance, for the period under review, of £987.

Le Roi.—Corrected shipments for 1900 were 149.246 dry tons of an average value of $14.15 per ton. Cost of mining was $3.25 per ton. The new five compartment shaft now down to 900 feet level, has a daily capacity of 1,000 tons and as soon as the enlargement of the Northport Smelter has been completed the shaft will be supplied with its full quota of ore.

London Consolidated.—This Company's Silver Hill mine has been added to the shipping list. The first consignment was 100 tons sent Hall Mines Smelter and the management expects to ship an average of 25 tons per day. Vigorous development has been prosecuted with result that a large quantity of good ore is now on dump, with much more in sight in the mine. The list of shippers is steadily growing, but we cannot have too many additions to that list.

Queen Bess Proprietary.—This English Company, a subsidiary of the Duncan Mines Limited, owns the Queen Bess lying between the Payne on the North and the Idaho on the South. The vein carries high grade silver-lead ore netting $60 per ton at the Smelter, but the excessive costs of mining and transportation make heavy inroads into this amount. When a tramway to connect the railroad and the new No. 5 Tunnel is completed costs will be very materially lessened. For the past twenty months the Company has been steadily developing at depth. Shipping has been continuous, but proceeds from ore sales have gone back into the mine Last September a crosscut tunnel through the country rock was started with the object of tapping at considerable depth the leads exposed by the five upper tunnels. A three drill compressor was installed and has driven the tunnel 1835 ft; the tunnel is 7x9 ft. in the clear. The average rate of progress was 125 ft per month, but there was a record of 192 ft. in one month. A shaft from the No. 5 Tunnel has been sunk 245 ft. on the vein and a raise is now being driven to connect with the shaft. This raise will be 185 ft. high. The new tunnel will be the main working of the mine, all ore, supplies, &c. being handled through it. All the proven Slocan mines are now driving long tunnels to tap their veins at depth and an era of comparatively deep mining may be expected to follow. At present there are few mines in the District which have more than scratched the surface.

Sullivan.—This East Kootenay mine has entered into new contract with the C. P. R. and its Trail Smelter under which the mine will ship during the year on a graduated freight and treatment rate, this rate depending upon the quality and quantity of ore shipped It is claimed this new contract will give the Company an average of $2 per ton more than its former contract. During December shipments amounted to 1330 tons.

Sultana Nickel.—This property comprising 2640 acres in townships of Drury and Trill and owned by J. B. Miller and H. W. Eveden has been sold to Charles Neumann and Judge Kraus, of Chicago, the price it is said being $250,000. This is the most important transaction in nickel lands that has occurred for some time. The new owners claim they have the most marvelous nickel deposit known to exist and they intend to work it on a very large scale. The property is 26 miles west of Sudbury, Ont.

Britannia Copper Syndicate, Limited.—Two meetings of the shareholders were held in Vancouver on February 4th. At the ordinary annual meeting over 80 per cent. of the issued capital stock was represented. After transaction of routine business the shareholders re-assembled in an extraordinary general meeting to amend by-laws, act upon a proposal to consolidate the 7-10 of the Britannia group of copper-gold claims with the 3-10 heretofore owned by Leopold J. Boscowitz, and the adoption of a general policy under which the management might either sell the property or devise ways and means for proceeding with development. The shareholders authorized the purchase of the Boscowitz 3-10, and the entire ownership of the Britannia group is now vested in the Britannia Copper Syndicate, Limited. The by-laws were amended and the directors authorized to proceed with the formation of a new syndicate having an authorized capitalization of $3,000,0000, to which, when considered by them advisable, the Britannia group shall be transferred for ⅔ of the capitalization of the new incorporation, the remainder to be devoted to opening and equipping the mines and the erection of suitable reduction works. Several proposals from Americans and Europeans for purchase of the Britannia group at prices ranging from £150,000 to $1,100,000, quick cash, all of which were referred to the directors.

Crow's Nest Pass Coal Company.—The Company at a recent special meeting voted to increase the capitalization by issuing 60,000 additional shares, thus raising the capitalization from $2,000,000 $3 500,000. Of the new stock 20,000 shares or $500,000 worth will be issued at once, and the remainder held back for the meantime. It is understood that the new stock goes to the old shareholders at part in the proportion of one share to every four held. At a subsequent meeting of the shareholders the action of the directors was confirmed. Of the new issue of stock one-third will be issued at once and the rest when the needed stock issued has already been subscribed at a premium of $15 a share. Mr. Elias Rogers, managing director of the Company, at the meeting, stated that if the present prospect of securing the southern market materialized $800,000 would be spent this season in mining and building coke ovens. Mr. Rogers said that the company had 312 coke ovens burning, and was taking out of the mines from 1,200 to 1,400 tons of coal a day, about half of which is going to the ovens.

Mineral Products Company.—This Company controls deposits of pyrolusite in Albert and King counties. Besides the deposit in the Dawson settlement, the company owns Stockton Mine, near Sussex, as well as some undeveloped properties in other parts of the Province. Mr. Russell P. Hoyt, general manager of the company, has been seeking concessions from the St. John authorities for a smelting furnace, whose output will be 100 tons of ferromanganese per day.

B C. Copper Co.—The contract for the converting plant for this company has been secured by the E. P. Allis Company, of Milwaukee. It is to be ready for delivery in three months. The machinery will cost in the neighborhood of $40,000 at the factory. The plant consists of a blowing engine, one stand of converters, a 40-ton electric crane, a crushing plant and the necessary accessories. By the time it is ready to be installed a second furnace will doubtless be added to the smelter, bringing the daily capacity up to 600 tons. Roughly, this will produce 40 tons of matte, and that passing through the converter means 20 tons of blister copper, averaging 98½ 99 per cent.

Anglo Canadian Lead Syndicate.—At the first annual meeting of shareholders held in London recently the directors report for the year stated. The Company having after some delay, completed its arrangements with the Vendor, including the legal formalities in respect of the title and conveyance, proceeded to select a new Manager for the Mines, and, as the result of careful inquiries, they appointed Mr. E. J Walsh, of Ottawa, who has been located at the Mines since the 9th of May last, and has been energetically at work on the necessary erection of new Plant and Machinery. At the same time he has, by repairing and utilizing the old Plant as far as possible, carried on the work of mining and concentrating, made shipments of Ore and Concentrates, part of which consisted of ore raised since he took charge of the Mine The sum of £1,161 18s. 10d. was recently received from the Smelters in London, as proceeds for part of the first cargo, which assayed as follows:—

Bullion Lead in Concentrates	63. 5 per cent.
Silver per ton of do.	14.87 ozs.

The North Star Mining Milling Company, Limited.—Under date of 7th. January. Statement of Ore Shipments for quarter ending 30th. November 1900.

Tons of Ore Shipped	5353
Net Profit	$92,787.42
Less Dividend for quarter paid 15th Dec.	39,000.00
Surplus	$53,787.42

A dividend of 3 per cent. has been declared for the quarter ended 28th. November.

Corinth Mines Limited.—The following is excerpted from the director's report submitted to the shareholders on the 4th. ult:—

During the past season the prospecting operations referred to in the last report have been carried out on the Company's property. These brought about the discovery of an outcrop on which a little sinking was done, with the result that a pocket of payable ore was uncovered, from which 75 tons have been extracted. This ore is now in course of transit to the smelters for treatment and realisation and it is expected from the manager's estimate that, after allowing for the cost of extraction, a profit of £500 will be realized and that the gross return will to a great extent cover the year's expenses in connection with the mine. In addition the Mine Manager states that there remains yet unextracted a quantity of about 40 tons of ore of a similar character. In view of this discovery, and as Mr. J. D. Kendall, the Consulting Engineer (who, as the shareholders are aware, is well acquainted with the company's property) was in the neighbourhood, it was

arranged for him to again examine the mine in order that he might ascertain by further inspection, whether there was any likelihood of the ore continuing in depth. His report has been received, but it is unfavorable in this respect; and he does not recommend the exeenditure of any further money on the property by the company. It is therefore intended, as soon as the payable ore has been taken out, to close down the mine.

Tyee Copper.—Mr. Pellew-Harvey the company's engineer, reports for month of December, under date January 16; up to December 31 over 600 feet of development has been accomplished on this property, and a fine wagon road has been built from the railway station to the mines and other important and permanent improvements carried out. A modern compressor plant with hoisting and pumping machinery is being installed. (Office note. A cable to hand states that machinery will be in operation on February 4). A working shaft 13 feet by 5 feet is being sunk to a depth of 500 feet after which connectins will be made with the workings in the western portion of the mines and No. 2 shaft, which has already been sunk to a depth of 233 feet vertically. At the 200 feet level a crosscut north has intersected the ore chute, which at the surface yielded handsome returns. At this level large ore bodies have been met in the eastern workings of the property, one of which consists of copper schist of a payable nature, 15 feet wide, and parallel to this a higher grade lode has been met on a crosscut, showing 24 feet of good ore, the pay shoot being 4 feet wide, and yielding 8.88 per cent. copper, 0.72 ounces gold, and 3.5 ounces silver per ton. The overage of the 24 feet from a series of assays yield 4.5 per cent. copper, 0.247 onnces gold, and 2.4 ounces silver per ton.—Note. With such a large body and facalties for local treatment, which is contemplated, it is expected large profits will result.

Granite.—The report from the Granite mill as to last month's run is as follows: Tons crushed, 706.7; bullion recovered, 438 ounces; concentrates, 34¼ tons; gross values, $8 500; percentage of extraction, 85 2. A special feature in connection with the Granite mill is the high percentage of values recovered as evidenced by the monthly statement issued. The figures are exceptionally high, and a constant high average is maintained. The recent shortage of water in the creeks supplying the mill is not as serious now.

CON. CARIBOO HYDRAULIC.

Manager Hobson Reviews a Successful Year's Operations.

The following is excerpted from the annual report of Mr. John B. Hobson, M.E., General Manager of the Consolidated Cariboo Hydraulic Mining Company, presented at the annual meeting of shareholders held at Toronto on 23rd instant :—

The canals opened earlier than usual under the influence of the warm Chinook winds that prevailed during the last two weeks of March, and washing commenced on the 4th of April, about two weeks earlier than usual.

The mine was operated 171 days and 13½ hours, with a quantity of water varying from 2,500 to 2,750 miner's inches.

The seasou's mining operations were divided into three runs, as follows :—

Washing was commenced in Pit. No. 1 on the 4th day of April, and was continued for a period of 66 days 1½ hours, ending on the first day of July. During the run 170,753 miner's inches of water was used to wash out 791,899 cubic yards of gravel and top clay, from which was recovered 7,867 ounces of gold, valued at $134,728.45, an average yield of about 17 cents per cubic yard, and a daily product of $2,039.48. The duty of the water attained was $4\frac{63}{100}$ cubic yards of gravel per miner's inch.

Washing operations were confined mainly to the ground thrown down by the bank blast exploded in August, 1899, and March, 1900. Both bank blasts included a large percentage of the clay and low grade gravel lying on the south-west rim, east of "Dancing Bill" Gulch. The inclusion of so large a percentage of low grade material explains the cause of the low average yield of 17 cents per cubic yard.

The second run commenced on July 2nd, continued for a period of 68 days and 12 hours, and ended on September 30th. During the progress of the run 188,375 miner's inches of water were used to wash out 751,000 cubic yards of gravel and top clay, from which was recovered 9,058 ounces of gold, valued at $154,848.41, an average yield of $20\frac{63}{100}$ cents per cubic yard, and a daily product of $2,260.56. The duty of the water attained during the run was $3\frac{98}{100}$ cubic yards of gravel per miner's inch.

After the whole of the gravel and clay disintegrated by the banks blasts was washed out, the run was continued to completion by undercutting and caving the main bank by force of the hydraulic streams.

The breaking up of the large masses of indurated clay by hand and the delay in the delivery of explosives required for the second bank blast, and to keep the pit clear of boulders, caused a serious loss of washing time and explains the cause of the falling off of the duty of the water below that attained during the first run.

The third, and closing run of the season, commenced on the 1st of October, continued for a period of 37 days, and ended on the 9th of November, when the low temperatures closed the canals and ended the season's washing operations. During the progress of the run 101,750 miner's inches of water were used to cave and wash out 301,039 cubic yards of top clay and gravel, from which was recovered 3 $544\frac{5}{100}$ ounces of gold, valued at $60.508 91, an average yield of $20\frac{1}{100}$ cents per cubic yard, and a daily product of $1,635.37. The duty of the water attained was $2\frac{95}{100}$ cubic yards per miner's inch. The hard freezing of the gravel and lumps of indurated clay during several periods of low temperature retarded the progress of the pit work, and explains the cause of a further falling off of the duty of the water.

During the progress of the second and third runs about 5,940 cubic yards of gravel were washed from the lower bench through the bed rock cuts and sluice section No. 1. The product thereof was 320 ounces of coarse gold and nuggets valued at $5,470.00, an average yield of about 92 cents per cubic yard. This product is included in that of the second and third runs.

Washing operations were confined entirely to Pit No. 1, so there is no washing to report for Pit No. 2, which is practically in the same condition as it was at the close of the season of 1899.

SUMMARY OF THE SEASON'S MINING OPERATIONS.

Total Time occupied in washing in Pit No. 1.....171 days, 13½ hours.
Total quantity of Water used.....460,878 miuer's inches.

Quantity of Gravel, washed :—

From Upper Bench, Main Bank	1,693,554	cub. yds.
" Intermediate Bench	144,444	" "
" Lower Bench	5,940	" "
Total quantity washed during the season	1,843,938	" "

Average duty of the water per miner's inch.....about 4 cubic yards.
Gold product for season.....$20,470\frac{91}{100}$ Troy ounces.
Value of the Gold.....$350,085.77.
Average yield of gravel washed.....$18\frac{98}{100}$ cents per cubic yard.
Average product per washing day.....$2,041.30.

The loss of washing time that occurred during the progress of the season's operations is distributed as follows :—

Repairing Hydraulic Plant and advancing giants	5 days.	
Advancing and repairing sluices	5 "	11 hours.
Cleaning up	5 "	21 "
Delay in delivery of giants required for use on lower Bench	12 "	
Delay in delivery of explosives caused by unusually heavy roads	18 "	8 "
Repairing break on Morehead Canal		14 "
Total Loss of washing time	47 days	6 hours.

The receipts and expenditures attending the operation of the Company's mines for the season will be found distributed in detail in the following statement :

MINE OPERATION EXPENSES FOR THE SEASON 1900.

EXPENDITURE.

Lands and Leases—Rentals, etc		$ 2,137 50
License Account—Free Miner's Certificates		110 00
MINING—		
Labor and Board	$43,105 65	
Explosives	31,622 10	
Stores, etc	1,796 93	
Bank Blasting, including Explosives	7,646 87	
		84,171 55
Sluice Extensions and Maintenance		15,918 42
Port. Hyd. Plant Maintenance		5,014 14
South Fork Ditch Maintenance		5,301 27
Morehead Di ch Maintenance		5,061 05
Mine Light Maintenance		1,939 25
Camp Maintenance, Fuel, etc		1,926 55
Buildings Maintenance		1,175 95
Roads and Trails Maintenance		279 13
Wagons and Harness Maintenance		363 46
Telephone Maintenance		94 00
Melting Plant Maintenance		8 75
Stable Expense Account		1,495 44
Bullion Expense Account—		
Government Royalty	$5,567 45	
Transportation and Melting Charges	4,915 33	
		10,484 80
Transportation of Miners, etc		4 665 41
Mine office expenses		1,260 98
Stationery and Printing		291 67
Postage and Telegraph		156 81
Incidental expenses		31 25
Fire Insurance Account		485 50
Management		6,232 80
Tools and Implements—depreciation for saason		845 14
Horses and Mules Account—Loss for season		245 00
Wagons and Harne-s Account—Loss for season		34 25
Quicksilver Account—Loss for season		1,485 65
Total Operating Expenses for season		$151,181 72

RECEIPTS.

Profit on Stores sold to Employees	$2,835 76
Profit on Blacksmith Shop	95 90
Profit on Lumber sold	98 64
Rent received from Morehead Camp Buildings	30 00
Total Profits for Season	$ 3,060 30
Gold Product for Season	350,085 77
Total Receipts for Season	$353,146 07

INVENTORY.

There is on hand at the Company's mines as per Inventory taken November 15th, 1900:—

Miscellaneous provision stores and mining supplies	$16,575 43	
Explosives	10,703 52	
Quicksilver	1,351 00	
Blacksmith Stores	1,662 51	
Total Stores		$30,292 46
Tools and Implements		10,223 77
Lumber, Saw Logs and Flat Timbers		4,144 33
Horses		730 00
Wagons, Sleighs and Harness		1,753 75
Total as per Inventories		$47,144 31

WATER SUPPLY.

The quantity of water available for use during the season of 1900 exceeded that of the season of 1899.

Precipation for 1899	$28\frac{65}{100}$	inches
Precipation for 1900	$30\frac{67}{100}$	"
Exceeding that of 1899 by	$2\frac{2}{100}$	"

A large percentage of the winter snow disappeared rapidly under the influence of the warm Chinook winds that prevailed during the latter part of March, and while the remaining snow went off under more favorable weather conditions in April and May, it was not sufficient to fill the reservoirs to the height attained during the previous season. The heavy rains that fell during the summer and fall months afforded considerable water, and made up, in great measure, for the limited quantity of water afforded by the winter snow.

Quantity of water available for use in 1899	463,056	miner's inches
Quantity of water used in 1899	353,056	" "
Quantity of water remaining in the reservoirs at close of season of 1899	110,000	" "
Quantity of water afforded by precipation for season of 1900	370,878	" "
Total quantity of water available for use during season of 1900	480,878	" "
Quantity of water used during season of 1900	460,878	" "
Quantity of water remaining in Polley's Lake and Morehead Lake Reservoirs at close of season	20,000	" "

The 20,000 miner's inches of water remaining in the storage reservoirs will be added to the supply afforded by the precipation of the season of 1901.

WATER SUPPLY SYSTEM.

The winter frost and heavy rains brought down numerous small slides from the inner slopes of both main canals, and settlement occurred in two sections of flume built on the clay banks of the upper section of the Morehead canal, but nothing occurred during the season to cause a loss of more than 14 hours' washing time.

With these exceptions the water supply system remained in good running order throughout the season, and was maintained at reasonable cost.

CONDITIONS OF THE MINE.

The character of the deposits show a marked improvement as the workings are advanced up the channel. The heavy deposit of indurated clay overlying the gravel, on the southwest side of the channel, is decreasing rapidly. The pay gravel is increasing in depth in proportion to the decreasing in the thickness of the clay capping.

The channel appears to be widening, and the average yield of gravel washed during the season is a marked improvement on that of previous seasons.

The gravel on the lower bench continues of high grade, and will probably improve as the workings are carried around the big bend and advanced up the channel.

The gold saving appliances are in good running order and prove efficient for the economical removal of the gravel to the dumps and the recovery of a high per centage of the gold.

The Portable Hydraulic Plant is in good working order, but requires an additional 1000 feet of 24 inch steel pipe for necessary extensions next season. Pit No. 1, with this addition to hydraulic plant, may be considered in good condition for the ensuing season's operations.

A water supply equal to that of 1900 will assure a greatly increased gold product for the season of 1001.

The operating expenses will vary as usual with the quantity of gravel washed and the difficulties encountered during the progress of the seasons operations. Assuming that the clay capping will be successfully bank blasted and no accident occurs to interfere with the continuous operation of the mine, the operating expenses should not exceed about six cents per cubic ward of gravel washed.

NOVA SCOTIA NOTES.

The official returns of the gold production for the year ended 30th September last, are the largest in the history of gold mining in Nova Scotia.

As showing how gold mining in this Province is paying the following figures of the Richardson Gold Mining Company are interesting :—

Capital of the company	$100,000
Paid in dividends	26,500
Purchase of wharf and new machinery	15,000
Sinking fund	5,000
Total earnings in 1900	46,500

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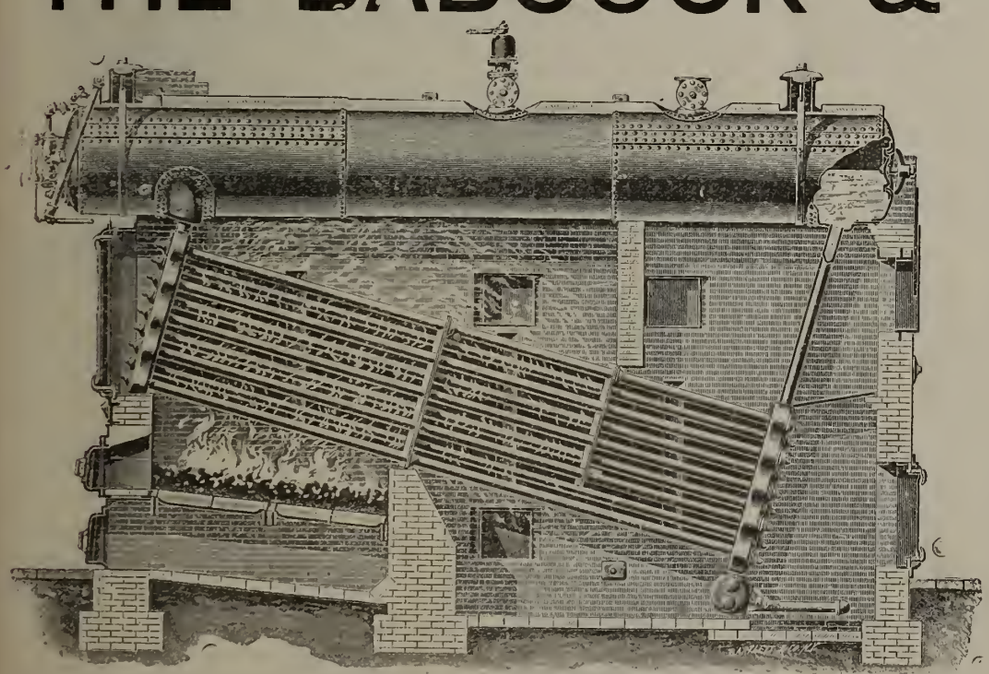

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This earning is the more phenomenal when we add that in 1896 the capital of the company was increased from $50,000 to $100,000, not by the subscription of more capital but by presenting the holder of each share with another share. Thirteen thousand four hundred dollars worth of shares, the property of the late George A Pyke were recently sold by auction in Halifax for $130⅓ each, the purchaser being Mr. A. H. Whitman, President of the company.

Of the earnings of the Richardson Mines last year only about one thousand dollars came from the sale of concentrates. The mine made about 400 tons of concentrates of an average value of $35.00 per ton, the sale of which had not been completed in time to go into last years dividends.

Mr. L. W. Getchell had only just started to re-open the Elk Mine at Caribou when the mill was destroyed by fire. Mr. Getchell proposes to install a cyanide plant at the mine.

We had a call from Mr. W. Prisk, manager of the Guffey Jennings Mine who informed us that the development work was progressing rapidly. Mr. Prisk brought 69 oz. of gold in with him, the result of crushings of rock obtained in the course of development work.

F. H. M.

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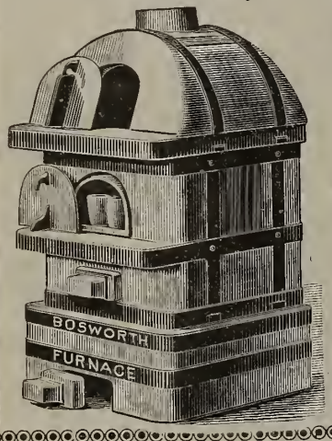

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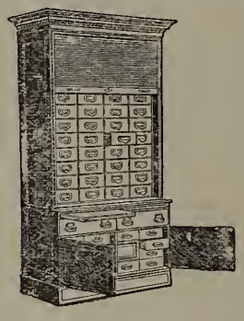

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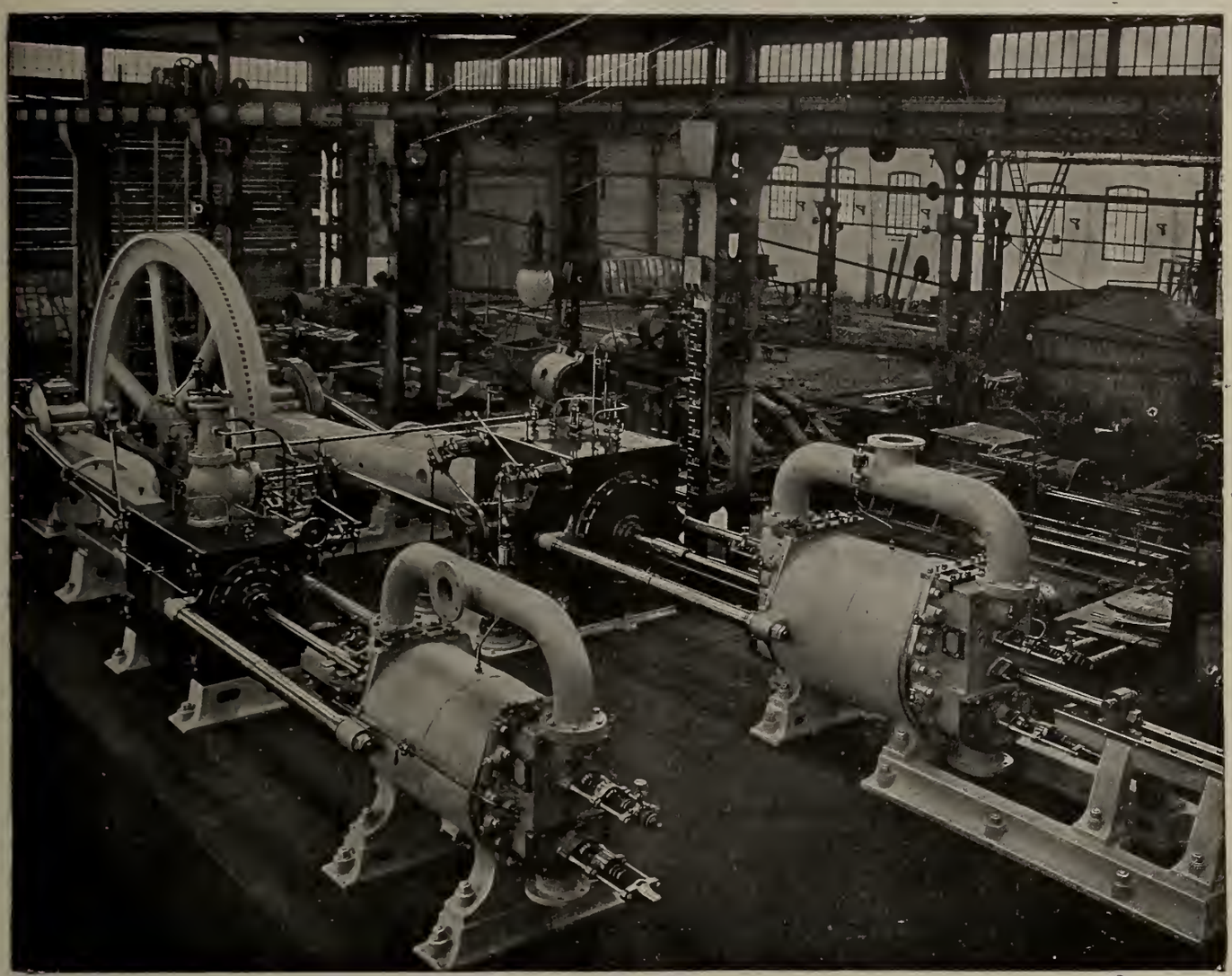

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MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN. May 10th, 1897.

DEAR SIRS,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you. We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

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QUEBEC MINING ASSOCIATION

The Annual General Meeting of the members of the General Mining Association of the Province of Quebec will be held in

WINDSOR HOTEL, Montreal,

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GEO. E. DRUMMOND, President.

B. T. A. BELL, Secretary.

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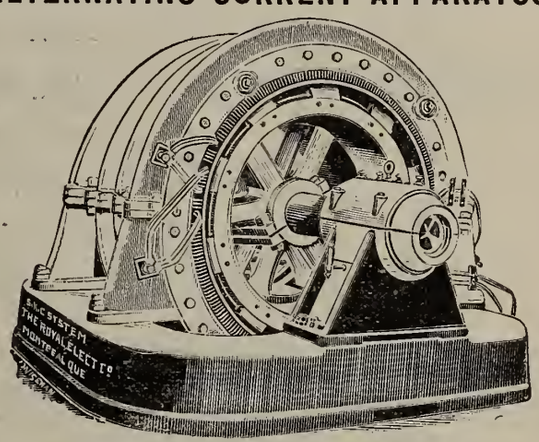

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—ON—

Wednesday, Thursday and Friday, 6th, 7th and 8th March, 1901.

ANNUAL DINNER, FRIDAY EVENING, 8th MARCH.

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By special agreement with the companies Members of the Institute and any Canadian Mine Manager or Mining Engineer attending these meetings will be carried to Montreal and return for a SINGLE FARE on the CANADIAN PACIFIC, GRAND TRUNK, INTERCOLONIAL, QUEBEC CENTRAL and CANADA ATLANTIC RAILWAYS. Members will ask for Convention Certificate when purchasing their tickets, pay single fare to Montreal, and on having Certificate signed by the Secretary will be returned FREE OF CHARGE.

SYLLABUS OF PAPERS.

The Syllabus of Papers for discussion at these meetings embraces a large variety of subjects of interest and value to Canadian mining men. Among those who have entered their names may be mentioned :—

Mr. HIRAM DONKIN, Glace Bay, C.B.
Prof. COURTENAY DEKALB, Kingston, Ont.
Mr. BERNARD MACDONALD, M.E., Rossland, B.C.
Mr. S. S. FOWLER, S.B., Nelson, B.C
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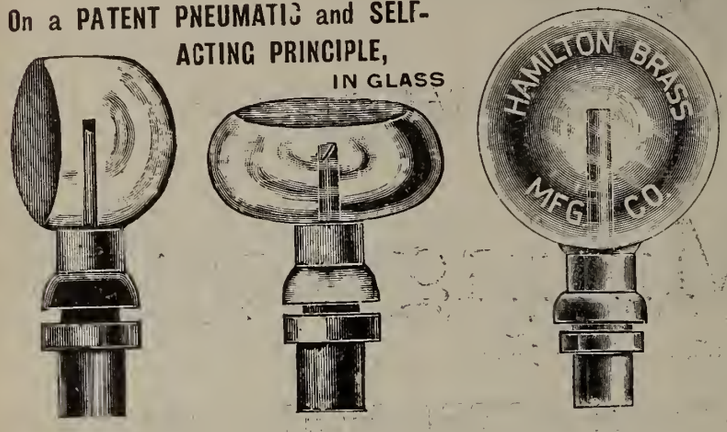

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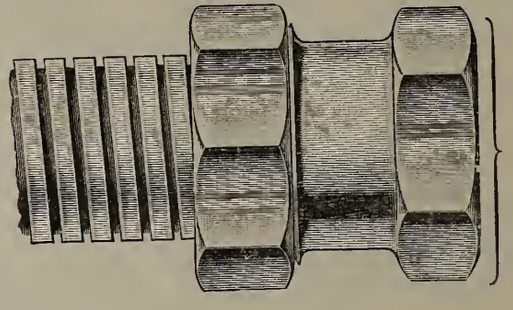

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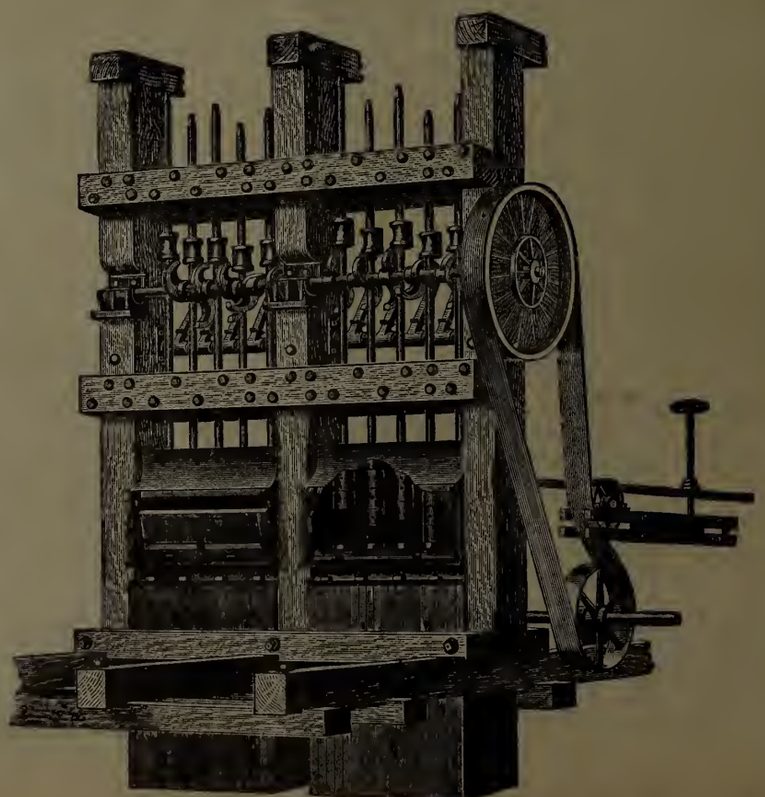

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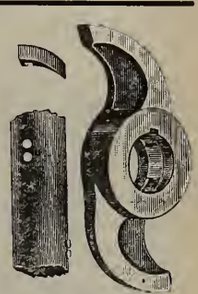

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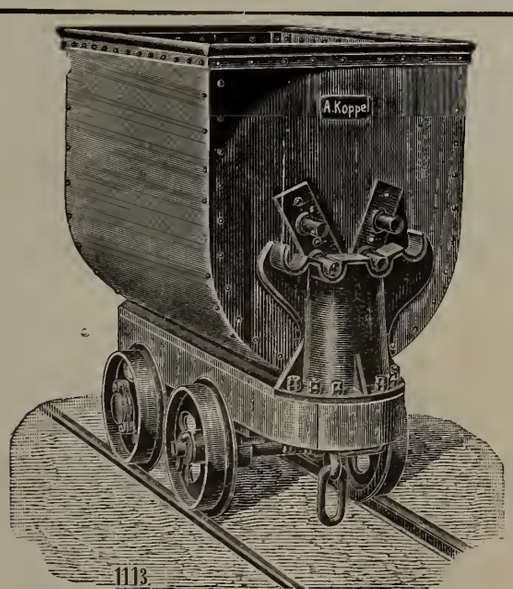

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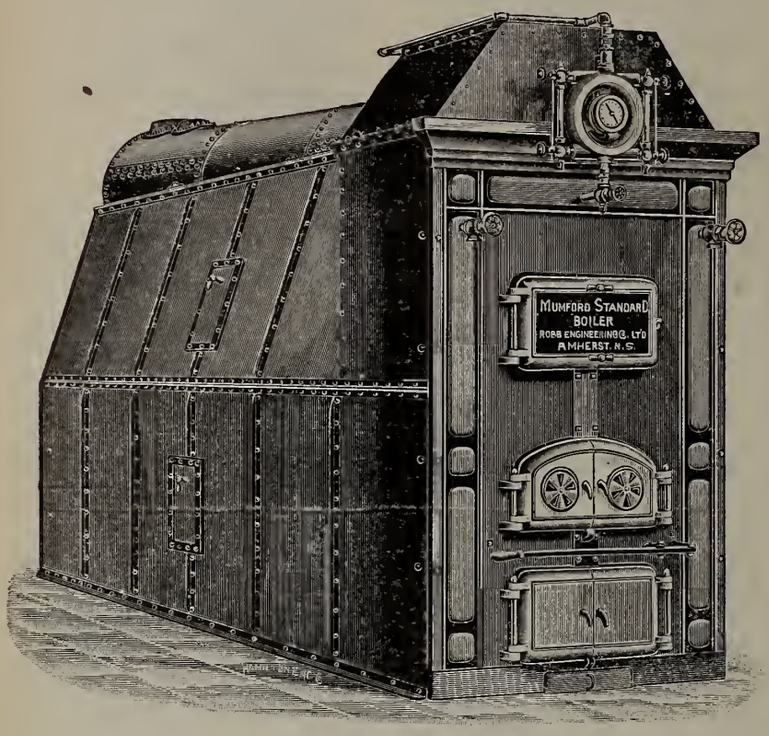

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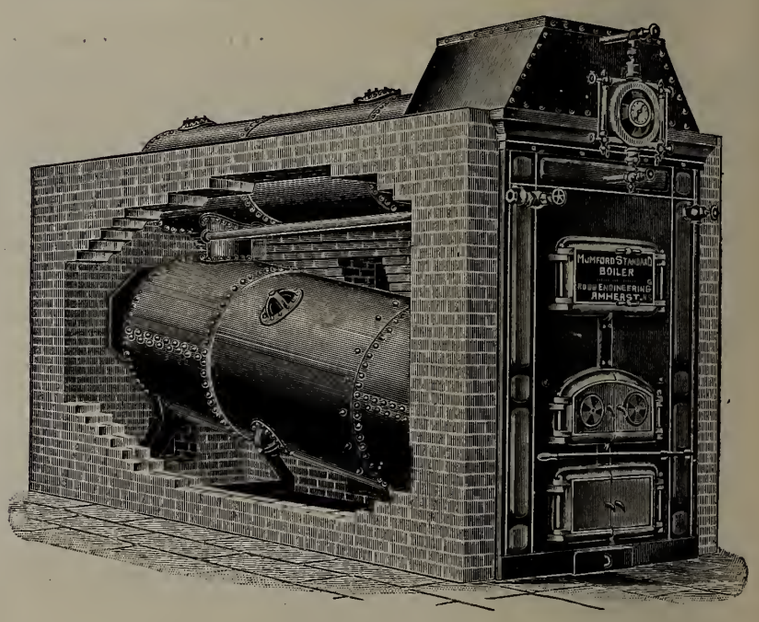

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We are herewith pleased to enclose result of test run on our new 40 DRILL COMPRESSOR. This test which was run under our own supervision as per agreement entitles you to a bonus of $1500.00 on results obtained from Intercooler. The COMPRESSOR delivered during the run the GUARANTEED 3960 cubic feet of free air at 62.7 revolutions per minute, while the maximum speed of the engine is 70 revolutions.

We wish to congratulate you upon your success in building a COMPRESSOR which in every way has proved satisfactory.

Youre truly,
THE CENTRE STAR MINING CO., Limited,
Alfred C. Gard
Chief of Construction.

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One 40-Drill Class "BB3" Cross-Compound Steam, Cross-Compound Air Compressor Lately Installed.

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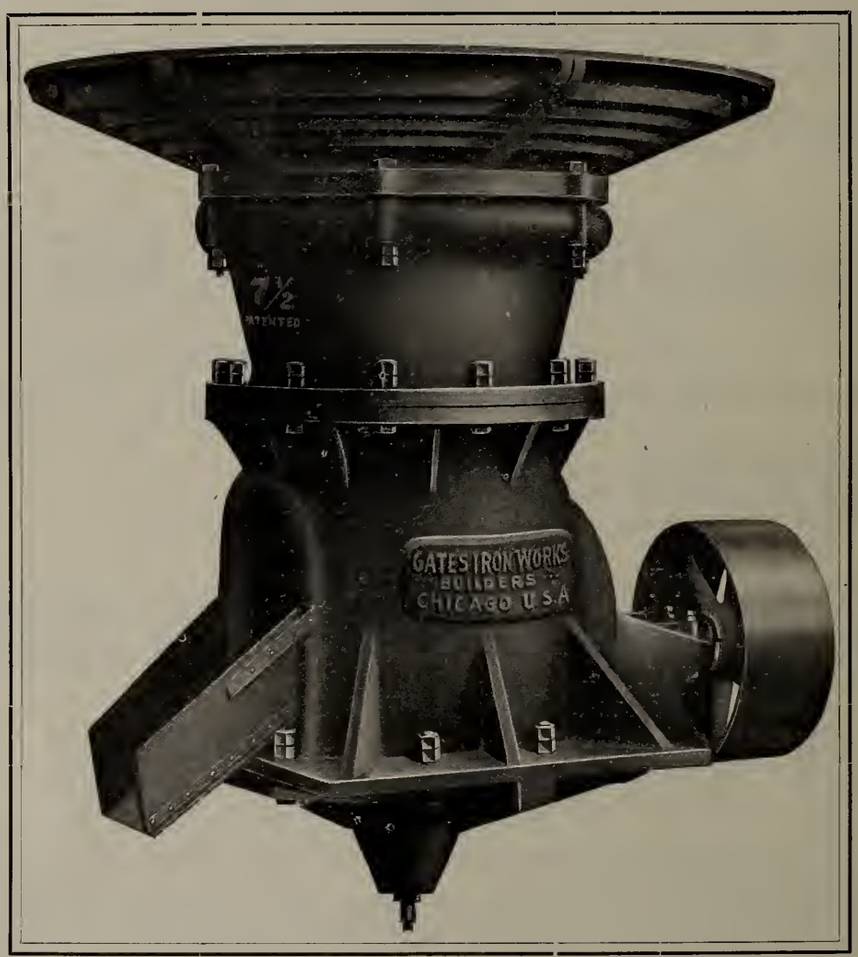

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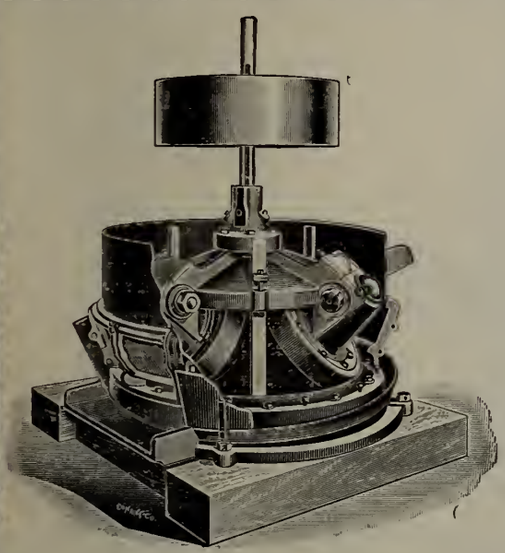

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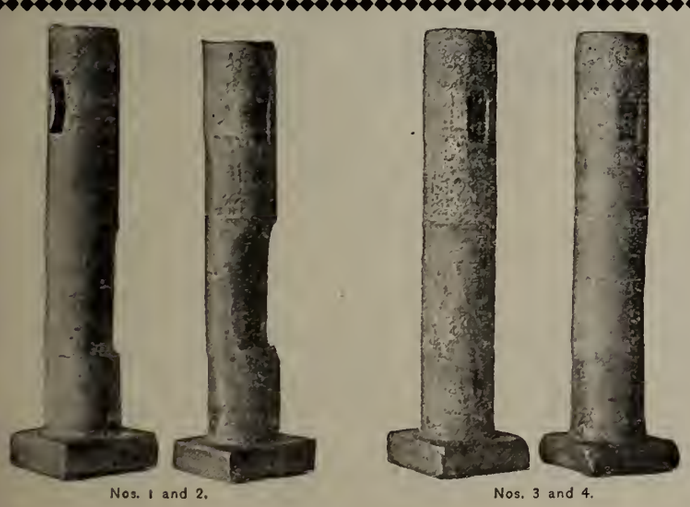

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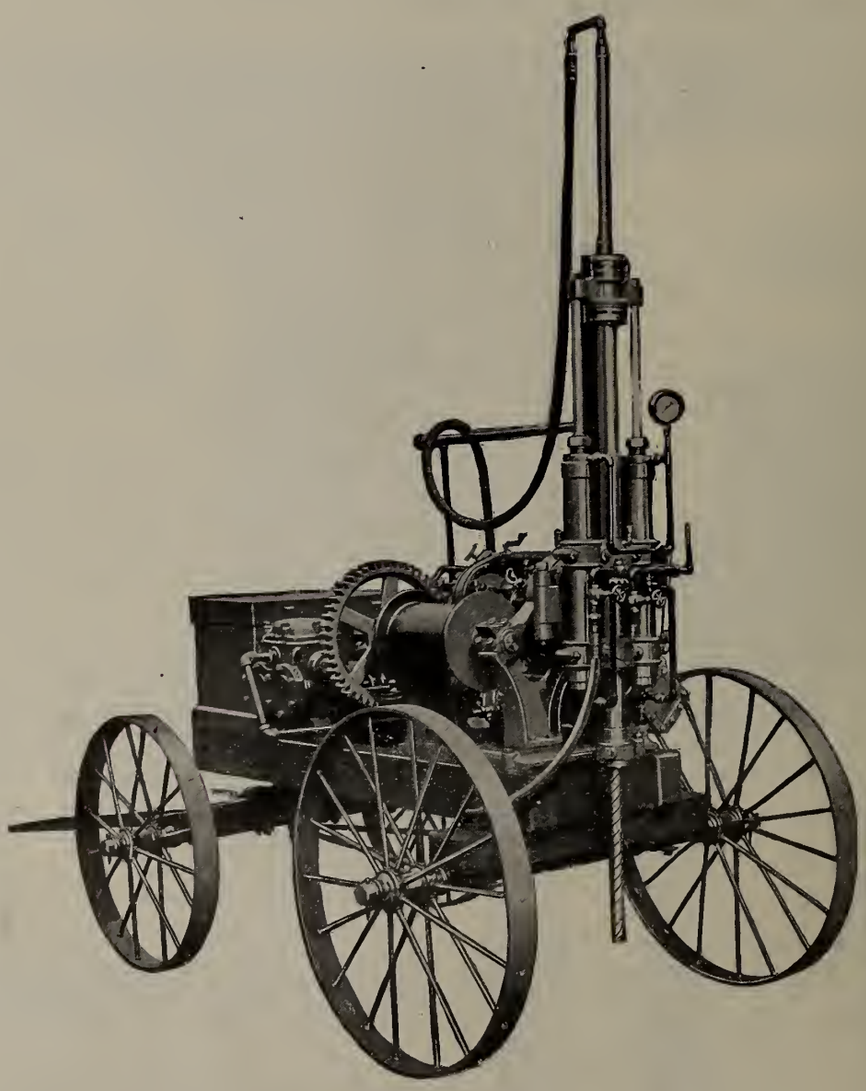

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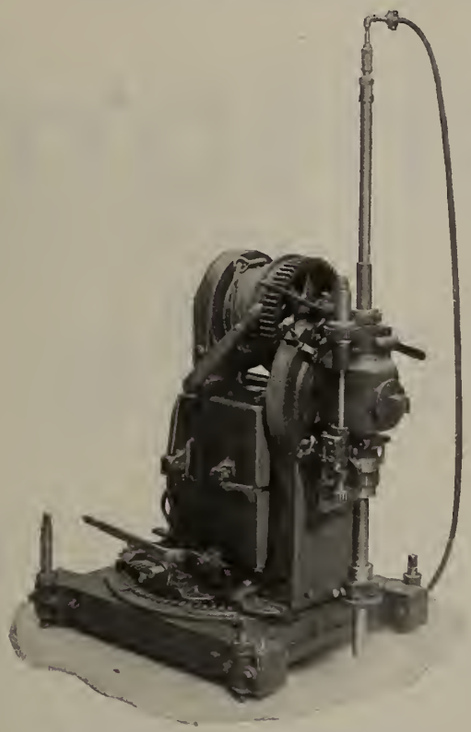

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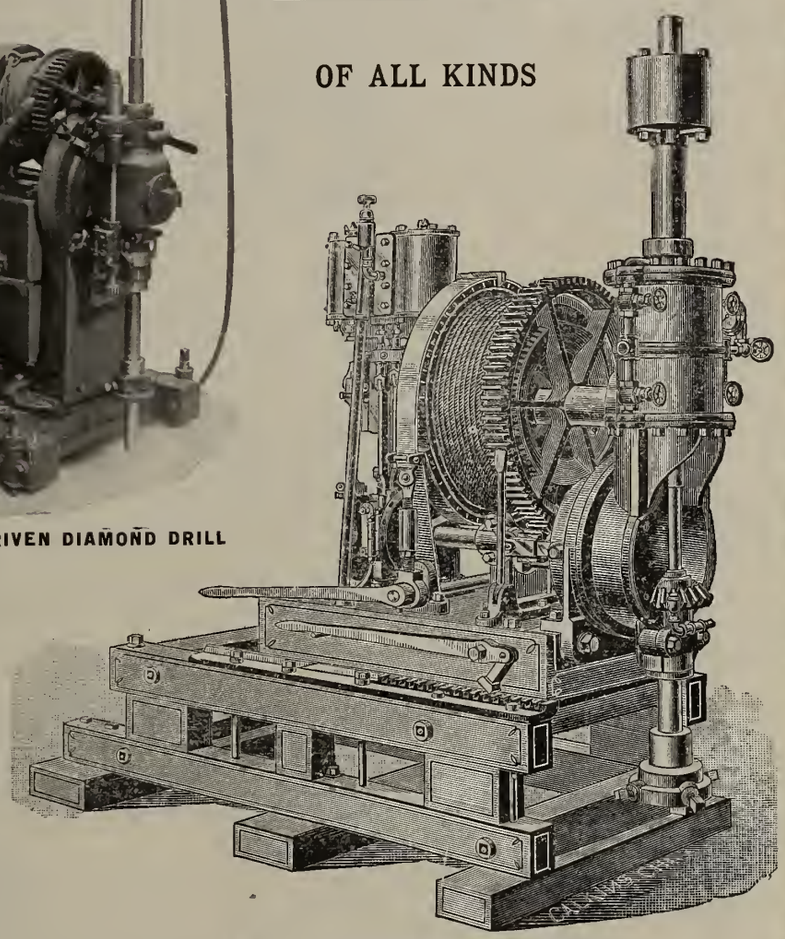

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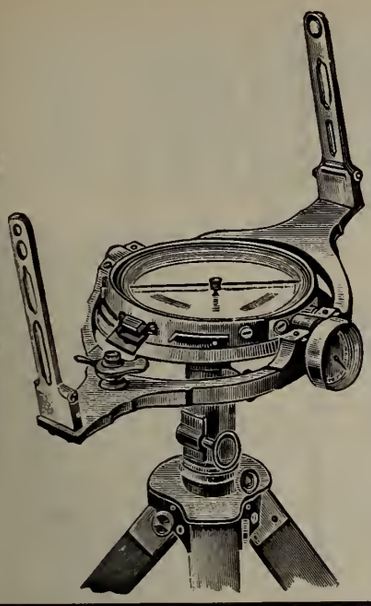

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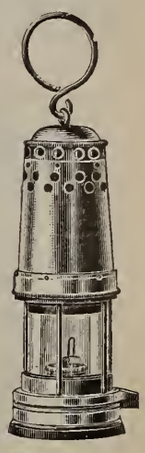

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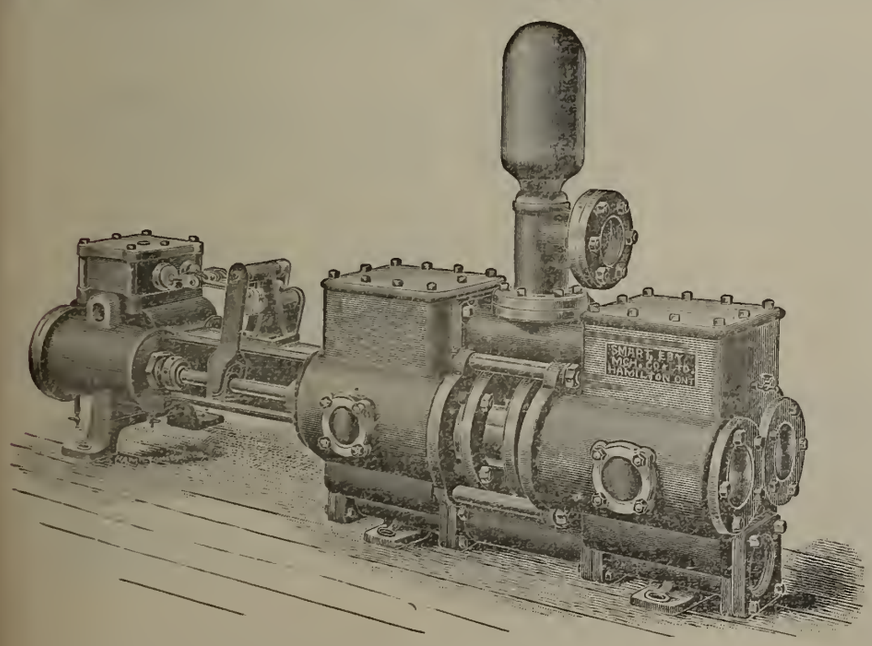

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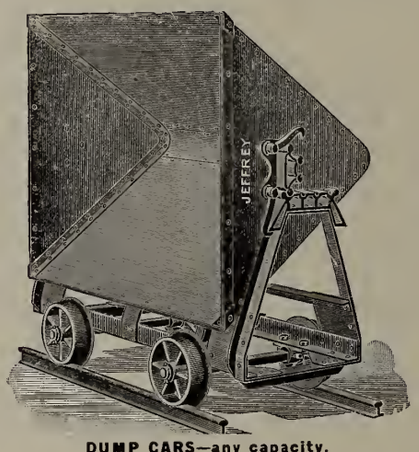

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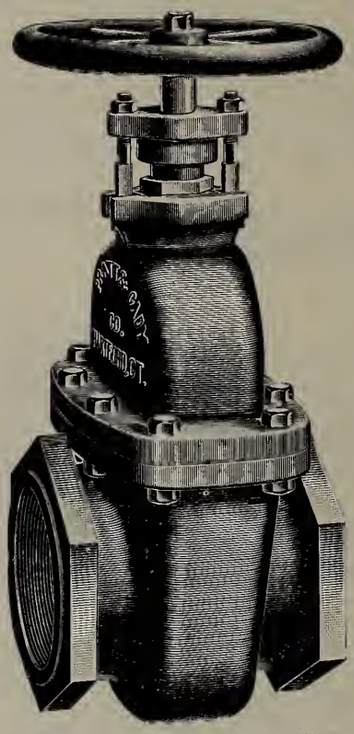

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Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite: copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HONORABLE E. J. DAVIS,
Commissioner of Crown Lands,

or

THOS. W. GIBSON,
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PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
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Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lieu on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to.

THE HON. C. E. CHURCH,
Commissioner Public Works and Mines,
HALIFAX, NOVA SCOTIA.

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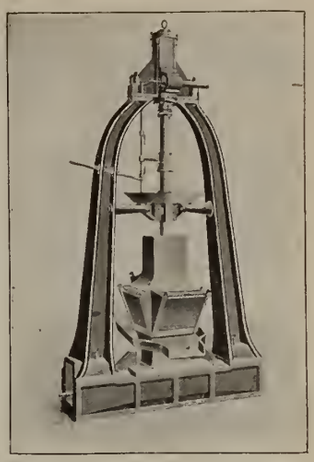

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Lot 2, Con. 4, " " "	315
Lot 3, Con. 4, " " "	315
Lot 4. Con. 4, " " "	315
Lot 5, Con. 4, " " "	319
Lot 6, Con. 4, " " "	318
Lot 12, Con. 3, Graham " "	274
Lot 12. Con. 4, " " "	290
Total	2,699

belonging to The Vermillion Mining Company of Ontario, will be sold at public auction, en bloc, at the Auction Room of C. J. Townsend, Toronto, Ontario, on the 14th day of May, 1901, at the hour of 12.00 o'clock noon, to the highest bidder. Terms of sale 10 per cent. cash, 15 per cent. in thirty days, 25 per cent. in four months, 25 per cent. in nine months, and 25 per cent. in eighteen months, the unpaid purchase money to be secured by mortgages bearing interest at five per cent. per annum. The Mortgage to be settled in case of dispute by the Junior Registrar of the High Court of Justice, subject to Appeal to a Judge of the High Court.

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The purchaser may pay the whole of the purchase money in cash if he desires.

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Molybdenite,
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"With regard to the Stamp Shoes and Dies, "Cams, and Cam Shaft Boxes, they are the best "I have ever seen. I would suggest that you "hold fast to them without change of any kind."

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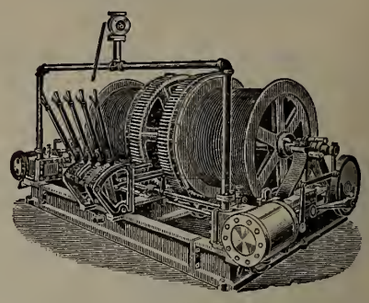

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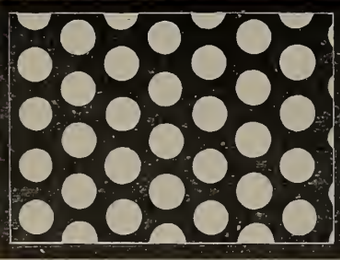

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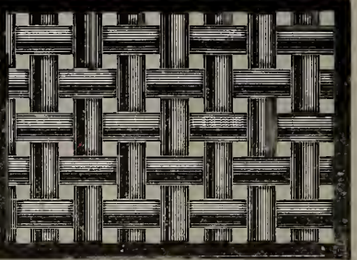

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Perforated metal of Steel, Copper, Brass, Zinc, for all purposes. Special attention given to

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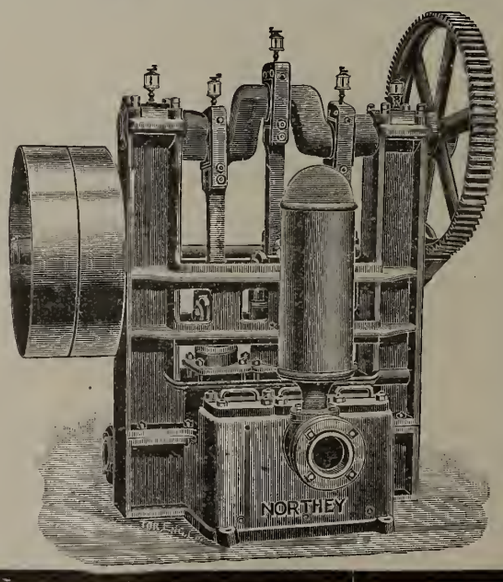
Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

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The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 3. MARCH, 1901. VOL. XX., No. 3.

British Aid in Developing Canadian Mines.

An interesting discussion concerning the capitalization of Canadian mining companies, with special reference to the custom of selling stock below its face value, took place at the March meetings of the Canadian Mining Institute in Montreal. The point was made that this practice rendered the sale of Canadian mining shares in the London market a difficult matter, inducing a prejudice against them. The English law requires that company shares shall be fully paid up, and of course it is easy to see that British investors, unused to Canadian methods, might not readily comprehend the true significance of the wide difference between the market value and the face value of such stocks. Though not directly so stated, the implication in the criticisms made was that the Canadian system favored a speculative tendency, inimical to the conduct of mining operations on a sound business basis. If such opinions as these are held in England it is time that the error in the conception should be explained. In the first place it makes little difference to the purchaser of a share what sum may have been paid for it in the beginning. Its value is, or should be, determined by its earning power. If the mine is one that promises large returns, the future productivity is sure to be anticipated, causing a rise in the value of the stock. If the mine offers no such speculative feature, but is well proven and recognized as a steady producer of ores of even grade, the price of shares will seek a fixed level, fluctuating chiefly with the condition of the money market.

On the other hand, the custom of issuing stock below par, sanctioned by Canadian law, finds its justification in the pioneer conditions of the country. The burden of proving the resources of a new country rests primarily upon its own people. In such a country the bulk of the capital is remuneratively employed, and usually is insufficient for the enterprises in hand. It would be difficult to obtain support for new ventures unless inducements were held out to investors of small means. In this way funds may be obtained from a large number of small individuals, when it might be wholly impossible to secure them from a few only. It must be understood that these special inducements are extended only when the mine is still in the development stage, while the chances of success are still largely problematical. Under the circumstances a system of this kind is not only warrantable, but practically necessary, if the available resources of the country are not to lie dormant. We cannot expect foreign capitalists to come in and do this pioneer work. It is one of the prerogatives of pioneers to take chances in a small way for the sake of possible rewards of large size. This is one of the ways in which large fortunes are quickly amassed in a new country, and we cannot see wherein the method is objectionable.

If the London investor wishes to share in these advantages he is at liberty to do so. We are aware that many so-called development companies organized abroad have ventured into this attractive field, and usually with disastrous results. That these should fail when those native to the soil so often succeed would seem to argue some peculiar merit in the pioneer which the old world investor does not possess.

The advantages of fully paid up capital may be on the side of the foreigner, but he is not as well able to conduct enterprises unaided in a new country. He puts his confidence in engineers and managing directors who lack the experience needed to operate cheaply under the conditions found in Canada. His scheme from first to last is conducted generally on too magnificent and costly a basis. We insist that the poor native knows best how to exploit his resources, and could show his friends from over-seas many novel and inexpensive short cuts to success. But he needs capital, nevertheless, and accessions from London, applied in the right way, would be productive of good results to both. If some of the large British development companies were to pursue the policy of co-operating with local development companies, important mutual benefits would be conferred. Local capitalists would thus find the aid which they need to develop promising properties, and the metropolitan companies could operate over a larger field with the same amount of capital which, concentrated at a few points only, would increase their chance of loss and limit their possibilities of bringing out many good enterprises. In some such way as this all the difficulties in the case should be removed. The local development company would stand for what it was and nothing more, until the parent or auxiliary corporation was justified in organizing a full fledged mining company in the home market, to take over the enterprise, where the capitalization could be carried out in accordance with the methods there in vogue. We recommend this plan to our friends across the water as one in which they may profitably use their capital, and assist in promoting the prosperity of Canadian mining. At the same time they may share in the advantages of the pioneer with comparatively little risk. We firmly believe it would improve the prestige of Canadian mines if the initial stages were under control of development companies, making no pretense to stand as yet upon a productive footing, organizing a mining company only when the property had fully passed the doubtful period, when it might be regarded as a truly sound business venture.

The annual general meetings of The Mining Society of Nova Scotia will be held in Halifax on 10th proximo.

Exportation of Natural Gas.

It is reported that the Ontario government contemplates interference in the matter of exportation of natural gas from Essex county to Detroit. The Ontario government, by virtue of its rights over the land and water through which the pipes are laid which conduct the gas across the Detroit river, proposes to cancel the lease to the Interior Construction Co., the present owner of the pipe line. The case, however, seems to offer some difficulties. The original Ontario Natural Gas and Oil Co., acting within its legal powers, entered into a contract with the Interior Construction Co. to furnish it with gas for export while the field continued a producer, and on the strength of this the pipes were laid, and the Detroit Gas Co. made the necessary provision for supplying its customers. Under these circumstances it would apparently work an unwarrantable hardship upon these corporations to infringe upon their enjoyment of rights which they acquired in good faith, and in a legal manner. In principle we think any interference by government in the exportation of the natural products of a country is unwise, and apt to be productive of more evil than good. There is something to be said, however, in favor of the position taken by the Ontario government. The contract with the Interior Construction Co. does not give it any exclusive privileges against the consumers on the Canadian side of the line, and it appears that gas is being sold in Detroit very largely to manufacturers for steam raising purposes, while at the same time the supply is so limited that Canadian manufacturers formerly using the gas have been obliged to abandon it. This is manifestly unfair. Consumers on both sides of the line should at least be placed on the same footing. The employment of gas for manufacturing is certainly improvident in view of a declining yield from the wells. It should be limited to the use of household consumers as is done in the case of the Welland county field.

A Free Welland Canal.

The tolls from the Welland Canal for 1900 amounted to only $100,000, a fact which was pointed out with some trenchant remarks on the inexpediency of burdening and obstructing commerce for so small return, by Mr. H. A. Calvin, M.P. in the recent debate in the House of Commons at Ottawa on the proposals of the ministers of Public Works and Marine and Fisheries, regarding aids to transportation. The discussion chiefly turned upon the effect which the abolition of tolls would have on the grain trade, and was coupled with the consideration of deepening the Welland canal so as to make it a link in the chain of lake navigation instead of a part of the river and canal system.

This is all important enough, and in itself should stimulate the government to take measures that will realize to the full the opportunities for attracting a larger commerce into the lower lake, which is now cut off from any extensive participation in the lake-borne traffic. But Mr. Calvin might have gone farther, and have strengthened his argument by pointing out how the removal of tolls would facilitate the growth of manufacturing by admitting cheaper fuel to the large and populous belt tributary to Lake Ontario. At present coal passing the Welland canal—if any should offer—must pay 20 cents per ton for the privilege, with an additional 5 cents per ton on the tonnage rating of the vessel. This amounts virtually to an embargo, and forces the Lake Ontario ports to depend entirely upon coal brought from the Reynoldsville district to Charlotte. The result is that a larger price is demanded for this coal than for similar or better coal from western Pennsylvania, West Virginia, or Ohio, laid down at Ashtabula, Cleveland, and Sandusky. If these latter coals attempt to compete with the Reynoldsville product on Lake Ontario they can be driven out of the field by a lowering of the price, having this margin of tolls as a protection against close competition. The lower lake cities are thus left at the mercy of the vendors of Reynoldsville coal and coke, which means that industry is so far impeded. There is nothing more vital to the commercial life of any people than its motive power, and one of the chief concerns of the government should be to do all in its power to admit of this being obtained at the lowest possible cost. The difference between the condition of the Ontario ports and those on the upper lakes is seen from the fact that slack coal at Windsor and Sarnia can be bought at prices ranging from $1.90 to $2.00 per ton, while on Lake Ontario it cannot be had for less than $2.65. At least 75 cents per ton could be saved to Lake Ontario consumers if free competition were possible.

In the same connection it may be pointed out that the tariff on coal works a wholly unjustifiable disability upon all classes of industry in which steam generation is essential. For the sake of protecting the coal fields in the extreme eastern and western portions of the country —a protection or prohibition by the way which is not effective—a duty is levied upon slack of 20 per cent. *ad valorem*, or not to exceed 13 cents per ton of 2,000 lbs., and upon bituminous coal of all other grades of 53 cents per short ton, so that the great bulk of the population of the country is taxed on this prime necessary of progress in a vain effort to keep coal at home which they could not obtain within reasonable limits of cost, owing to transportation difficulties, even if it did remain. If the object of the tariff is, as it appears to be in part, to force a more unrestricted market in the United States, the injustice is all the greater, since the country as a whole is burdened for the prospective advantage of a few mine owners, who seem to flourish in spite of the American tariff. The metallurgical industry, so far as it depends upon coke, is less hampered, since this product is on the free list, but still there stand the Welland Canal tolls, giving the Reynoldsville ovens the monopoly of the Lake Ontario field, or forcing the purchasers of Connellsville and West Virginia cokes to pay more than they should for it, rendering their efforts to compete in the iron trade just so much the more difficult.

These taxes on fuel are wholly irrational, and the sooner this article is rendered as free as may be, the better will it be for the prosperity of Canada.

Mining Progress in B.C.

From the returns of the mineral production of the Province of British Columbia for the year 1900, submitted to the local Legislature by the Provincial Minister of Mines, it is gathered that there was during the year an increase in the value of the output of the lode mines of the Province of $3,310,428 and a decrease in that of placer gold of $66,176, leaving a net increase in metallic minerals for the year of $3,244,252. There was also an increase of $1,013,238 in the value of coal and coke. No returns are yet available of the value of other non-metallic minerals so these cannot now be taken into account. The foregoing figures, though, exhibit practically last year's net increase, which was $4,257,490., as shown in detail in following table :

	1898.	1899.	Increase.	Decrease.
Placer gold.....	$1,344,900	$1,278,714	$ 603,494	$66,176
Lode gold.....	2,857,573	3,461,067	531,391	
Silver.....	1,663,708	2,295,097	531,291	
Copper.....	1,352.453	1,615,289	263.836	
Lead.....	878,870	2,690.577	1,811,707	
Coal, Coke.....	4,053,651	5,066,899	1,013,238	
Total.....	$12,150,155	$16,407,645	$4,323,666	$66,176

The Late Dr. Dawson.

It is our melancholy duty to record this month the sudden and untimely demise of the distinguished Director of our Geological Survey, Dr. George M. Dawson, C.M.G., who expired after a very brief illness at his apartments in the Victoria Chambers, Ottawa, on Saturday, 2nd inst. Dr. Dawson, it may be said, was in his office on Thursday, when he supplied the editor of the REVIEW with some valuable commercial data on the subject of Mica, and he dined at his club in the evening. On Friday he was confined to his room with what was regarded as a mild attack of bronchitis, which, however, assumed an acute form on Saturday afternoon, and the eminent Canadian geologist and scientist passed away shortly after six o'clock. Only an hour before, an old time British Columbia friend, Mr. John B. Hobson, M.E., of the Con. Cariboo Hydraulic, in company with the editor of the REVIEW, had called at the Chambers to consult the Doctor about a shipment of gold to the Glasgow exhibition, but while unable to see him, no-one then anticipated that his end was so near.

The death of Dr. Daw-Dawson is a national loss, and is deplored by none more sincerely than the mining profession in Canada, for whom he has rendered incalculable service.

George Mercer Dawson was born in Pictou, Nova Scotia. on August 1st, 1849, and at the time of his death was the eldest surviving son of the late Sir William Dawson, ex-Principal of McGill University, Montreal, whose eminence as a geologist and an educationalist will always be remembered in Canada. His technical education began at McGill College and was completed at the Royal School of Mines, at each of which he obtained his degree. At the latter he held the Duke of Cornwall's scholarship, given by the Prince of Wales; he also took the Edward Forbes medal in palæontology, and the Murchison medal in geology.

The first work of any importance in which he was engaged was in 1873, when in the capacity of geologist and naturalist to Her Majesty's North American Boundary Commission he investigated the country in the vicinity of the boundary line between Canada and the United States from the Lake of the Woods to the Rocky Mountains. The information thus gathered was, at the end of the Commission's work in 1875, published in the form of a report entitled "Geology and Resources of the Forty-ninth Parallel," and this amongst other things gave the first detailed account of the Souris coal fields, though some of the sections along the Souris bed had previously been visited by Dr., afterwards Sir, James Hector. The economic results of this were important, as setting at rest the question of a fuel supply for the prairie country. In July of the same year began his connection with the Geological Survey, with which he has ever since been identified. His first important trip in his new appointment was to British Columbia. where, until 1879, he was engaged in the exploration and geological survey of the Province. This has been the scene of his labors ever since, with very little exception, and the knowledge obtained of the geological structure, and the geological mapping of British Columbia, so far as it has gone, is almost entirely due to the energetic work of Dr. Dawson. From that time until 1882, he continued his labours in that Province and the North-west Territories. In the latter year he went to Europe, where he travelled extensively, visiting mines, metallurgical works, museums, etc. His most ardous journey after his return was with the Yukon expedition, of which he was selected by the late Hon. Thos. White to take charge; a very complete report of which has been published by the Geological Survey. The route he chose for himself, although of a most difficult nature, was taken as that most likely to afford the most information regarding the geology of the vast and virtually unknown tract of country he was about to explore. His journey was 1,300 miles in length from the mouth of the Stikeen River, by way of the Dease, Upper Liard, Pelly, and Lewis Rivers back to the coast. Nearly the whole distance was traversed by following the rivers; some of these had in former years been used by the Hudson's Bay Company, but they had long been abandoned as a trade route, and were at the time of his expedition almost unknown geographically. The difficulties encountered were

very great—boats had to be built at several points, and one portage of fifty miles was made through the woods in crossing from the drainage basin of the Liard to that of the Yukon—but all were surmounted and the expedition successfully accomplished its work.

Details of Dr. Dawson's travels throughout British Columbia and the North-west will be found in the reports of the Geological Survey. He is the author of fifteen separate reports, of which the following may be referred to as of most importance: "On the Queen Charlotte Islands," including as an appendix a monograph on the Haida Indians (1878); "On an Exploration from Port Simpson, on the Pacific Coast, to Edmonton, on the Saskatchewan," 1879; "On the Region in the vicinity of the Bow and Belly Rivers," 1882–4; "On the Physical and Geological Features of part of the Rocky Mountains," 1885; "Notes to accompany a Geological Map of the Northern portion of the Dominion of Canada," 1886; author (with Dr. Selwyn) of "Descriptive Sketch of the Physical Geography and Geology of Canada," 1884; author (with Dr W. F. Tolmie) of "Comparative Vocabularies of the Indian tribes of British Columbia, with an Ethnological Map," 1884. Perhaps one of his most valuable publications, from a mining standpoint, was his exhaustive "Report on mineral wealth of British Columbia," published in 1887. It is unnecessary to particularize the numerous and valuable original scientific papers on the geological, geographical, and ethnological observations made in the course of his explorations and contributed to various scientific journals; their value is well known and fully appreciated.

One of the most important of his public services was in connection with the Behring Sea arbitration. As one of the British Commissioners he spent the summer of 1892 in the Behring Sea region for the purpose of inquiring into the conditions and facts of seal life. The report of the Commissioners constituted the report of Her Majesty's Government on this branch of the subject, and was of great service. For his services on this occasion he received the thanks of His Excellency, the Governor-General in Council, and the C.M.G. from Her late Majesty.

He received the degree of LL.D. from Queen's University in 1890, and from McGill University in 1891. In the same year he was awarded the Bigsby gold medal by the London Geological Society for his services to the science of geology, and he was elected a Fellow of the Royal Society. In 1893 he was elected President of the Royal Society of Canada; in 1894 he was elected a corresponding member of the Zoological Society of London; in 1895 a Fellow of the American Association for the Advance of Science; in 1896 he was appointed by the Council of the British Association, President of the Geological Section for the Toronto meeting of the Association; and in 1897 he was awarded the yearly gold medal of the Royal Geographical Society for his work as a whole.

During 1898 and 1899 he officiated as a Vice-President of the Canadian Mining Institute, an organization in which he took the liveliest interest, and whose annual meetings he regularly attended.

Dr. Dawson was appointed Director of the Survey in 1895, on the resignation of Dr. Selwyn.

Perhaps we cannot do better than complete this bald outline of a distinguished career than by quoting from the sketch of his life, contributed by Mr. R. W. Shannon, in the *Commonwealth*:

"In private life Dr. Dawson was the most genial and charming of men. A careless nurse let him fall in childhood, and the fall broke his back. Keenly sensitive as he was by nature, he felt the deformity deeply and abstained from going into that society which his mental gifts and graces well fitted him to adorn. Notwithstanding that he was bereft of the fair proportions of noble manhood, and was, like the royal hunchback, sent into this breathing world but half made up, he displayed great vitality in early life, and often astonished the companions of his exploring expeditions by the vigour and endurance he showed in walking and riding. But the malformation of his chest prevented proper expansion of the lungs, and this fact, coupled with a more sedentary life, gradually impaired his active powers and rendered him liable to a dangerous onset of pulmonary or bronchial trouble. The end came in that way after years of suffering.

"Yet physical weakness and disease never depressed his bright spirits. His constant cheerfulness was a source of surprise to all who knew him, more especially to those who reflected upon the fortitude required to bear his bodily infirmities with patience. In conversation he was witty and humorous to a degree, while at the club, or at a public dinner, his sallies were wont to keep the table in a roar. A quick wise smile lit up his countenance when indulging in good-natured badinage, of which he was very fond; and when talking upon serious subjects his eye flashed with the intelligence which made his most trivial discourse iuminous. Rare and beautiful spirit, we shall not soon look upon your like!"

COAL MINING AND TRADE.

Undoubtedly the feature of the moment in the coal trade is the unprecedented activity in the Maritime Provinces, and the consequent stimulus to development work both in Nova Scotia and New Brunswick. The most sanguine person could never have anticipated such a rush for coal areas as is to be seen in Cape Breton, where every available section has been taken up, and holders who a few years ago were hawking their areas at $12,000 a square mile, are now sitting tight at $20,000 to $25,000. This may not be an unmixed evil, as it will have a tendency to check development and keep production within reasonable limits. It is a great mistake to assume that there is a market for all the coal that can be produced in Eastern Canada. The abnormal demand of last year is no criterion by which to judge of an average demand. Coal was scarce and dear all the world over, but that condition is already passing, and in England and the States prices are rapidly finding their normal level. In Canada, owing to the small margin hitherto existing between supply and consumption, and to the starting of the Dominion Iron and Steel Co., prices are being still maintained, and mines are being double-shifted to meet the requirements of the trade, but this will not last longer than it takes the new enterprises to get their coal on the market. If, as is predicted, the Port Hood Coal Co., the Inverness and Richmond Coal Co., and the Gowrie and Blockhouse Co., ship between them 250.000 tons during the present year, and the new mines of the Dominion Coal Co. produce 400,000, it is certain that an equilibrium will be established between supply and demand, with the inevitable result that prices will fall to about $2.00 f.o.b., which is the average for many years past. These remarks are not intended to discourage legitimate enterprise, but to suggest considerations which should weigh with every intending investor in coal mining, and so prevent in Canada what has been the curse of other countries—over-production, with the consequence of unreasoning competition and loss of capital.

The only outlet for an annual production of coal in Nova Scotia in excess of say 4,000,000 tons is the export trade. This does not refer to the U.S., where with the exception of the New England Gas and Coke Co., which has a long-term contract with the D.C. Company, the market will be merely nominal as long as a tariff is maintained, but the possibilities of a profitable trade with the West Indies, South America, and Europe. There has been no necessity for the D.C. Co. to seek a foreign market yet. And with the demand from the steel

MR. CHARLES FERGIE, M.E.,

WESTVILLE, N.S.

Vice-President and General Manager of the Intercolonial Coal Company, and Consulting Engineer to the Inverness and Richmond Collieries, Limited, elected President of The Canadian Mining Institute.

works and the gas company it is not likely that they will have a surplus for exportation during the next five years. Unless, however, we are very much mistaken, some of the newer concerns will be driven to seek foreign markets, and if so we may find a solution of this question sooner than seemed likely a year ago. We have always maintained that with special facilities for transportation Cape Breton coal can be laid down in British ports, at a net cost of $3 a ton, which is 50 cents below the minimum price on the Thames, and $1.50 below the average price for twenty years. This does not take into account the West Indian and South American market for briquettes, of which over 21,000 tons were shipped for those points from Cardiff, Newport, and Swansea in January. Now that coking on a large scale is being carried on at Sydney it would pay well to manufacture briquettes near the coke ovens, where tar is produced, and a and a percentage of coke-dust, which conduces to firmness, is at hand.

Our friends in the Maritime Provinces are "kicking" becanse the Government has purchased 100,000 tons of coal from the U.S. for the Intercolonial Railway. Surely this is a little unreasonable, in view of the fact that mines are working double shift to supply arrears of orders and coal is realising at least $1 a ton more than the Government would pay. The fact is that such a boom in coal as we have recently had upsets all calculations, and no-one was ready for it. Judging, however, from the feverish activity which now prevails, there will be little liklihood of a repetition.

Apropos of the development in Cape Breton, it is interesting to note the resuscitation of an old friend at Caribou Cove, adjoining the once notorious Terminal city. We wish the new-comers better luck, at the same time we are sceptical as to the existence of sufficient workable coal to warrant any large outlay.

On the opposite side of the Straits, a new combination, rejoicing in the title of the North American Coal Co., is to exploit areas in Richmond County. They have the usual nominal capital of $1,000,000; we shall be glad to hear that it is all subscribed and that they mean business. There are some favourable outcrops near by, and as the shipping facilities are superior to those possessed by any other property on the island, there is no reason why, with competent management, they should not establish a good mine.

Evidently the Port Hood Coal Co. expect to do business this season, as they have made a contract with the I.C.R. for 20,000 tons. This is their first transaction, and a very promising one.

The coal outcrops at Chimney Corner reported on many years ago by Mr. John Rutherford are receiving attention and efforts are being made to get a railway connection. Areas are held at a ridiculously high figure and it is evident that the holders think they have a bonanza. Investors would do well to wait a bit and see how the Port Hood and Inverness ventures turn out. The extent and condition of the seams at Chimney Corner are not matters of certainty.

There has been an unexpected delay in commencing to bore on the McVey areas owing to the machinery not having arrived We are looking for interesting developments on these areas and shall be greatly surprised if even the most sceptical do not have their eyes opened. It is not a little singular that the persons who have always been the most pessimistic in regard to the prospect of finding a good seam of coal here should be most prominently identified with the prospective purchasers. Perhaps, however, it is another case of "'tis nought saith the buyer." Judging from the splendid Core—10 inches in dia., which Mr. James Lewis exhibited at the recent meeting of the Canadian Mining Institute, the Calyx drill is far ahead of any instrument yet invented for boring and is not liable to break down through a similar mishap to that which put an end to boring in these areas in 1896.

CORRESPONDENCE.

A Rainy River Fake.

To the Editor:

SIR—Will you allow me to take up a portion of your valuable space to warn your readers against the most dangerous scheme that has yet been floated on a Rainy River property. The prospectus is a mass of misrepresentation, in which my name appears as mining superintendent, with quotations from a report which I have not made on a property that I have never seen.

The company is capitalized at $25,000,000, and owns as its total assets two undeveloped properties, and a hole in the ground once owned by the Boulder Company. The company make the statement that they have enough ore in sight "on the Boulder property than we will be able to mine in the next five hundred years." They are selling stock for the alleged purpose of putting up a 40-stamp mill, and promise immediate dividends as soon as this mill starts, and prophesy that the stock (now selling at 4c. to 5c.) will at once go up to par. Another quotation from this prospectus—"This mill will be only a starter. We have enough ore in sight to keep 1000 stamps busy continuously for the next hundred years." The facts are these:—There is a shaft on the Boulder 300 feet deep, with short levels at the 200 foot level. No payable ore has been struck. Another shaft, said to be 75 feet deep, shows a little ore. Other shallow pits have also shown streaks and stringers of good ore. There is practically no ore on the location as far as known, although it is possible that further development may open up payable ore-bodies.

We think that we have a district on the Lake of the Woods that will become one of the greatest gold producers of the world, but we need capital, and plenty of it, as it has become manifest to everyone that it is not a "poor man's country," and "grass-root propositions" are few and far between. How can we expect to get the capital necessary to develop our mines when such "wild cats" as the Ash Rapids Co. are absorbing the capital which otherwise would go to nourish some legitimate mining enterprise? Trusting you will pardon me for writing at such length,

CHARLES BRENT.

Detroit, Mich., 21st March.

Treatment of Auriferous Mispickel Ores.

By P. KIRKEGAARD, Deloro, Ont.

[Paper read before the March meeting of the Canadian Mining Institute.]

INTRODUCTION.

The ores of the Deloro Mine consist generally of quartz more or less heavily impregnated with arseno pyrite, "mispickel," with occasional copper pyrite and frequently a large percentage of iron sulphide.

These ores are worked for their gold and arsenic contents.

Above description applies to the Gatling or main lode, and also the Tuttle lode.

Other veins are being worked, which are quite different in composition, in that they contain large percentage of both oxide and hematite of iron, and in one case a great deal of graphite, and these latter ores require different treatment from the former to get best results.

This paper is only intended to cover the treatment of the mispickel ores.

These ores are mined in the usual manner. Where possible, the shafts are sunk to follow the lode on the incline and levels are driven north and south.

The strike is nearly north and south, and the dip varies from 45° to 63° to the horizontal.

The lode is irregular, varying in size from 4 to 5 feet, "the average," to 25 feet in places.

There are no defined walls; as a rule the quartz is merging into the wall rock, which is in some places talcose schist—in others diorite, the latter being the country rock.

The Gatling lode is now being worked to 4th level, being a depth of 310 feet on the lode, and sinking a further 100 feet is now being done, to open a 5th level.

Hoisting and Sorting.

The ore is hoisted to the shaft house in skips, dumped over a grizzley, the fines going direct to storage bins and the coarse carefully culled.

As a rule the white quartz carries little value,—hence this and all country rock is returned through a chute to the mine, where it serves a useful purpose as filling in the stopes.

Transportation.

All milling ore is passed to storage bins; from here it is filled into cars and transported to mill, over an inclined three rail tramway, 800 feet long.

Crushing.

Arriving at mill the ore is again dumped over a grizzley, fines going to bins, of which there are two, and the coarse to the rock breakers; the latter being set to crush to one inch ring. The feeders are the usual Challenge pattern, two ordinary in wood frame and two suspended.

The stamps, of which there are twenty, weigh 850 pounds each when newly shod

Ten stamps were erected in 1898; the other ten have been added recently.

The old ten stamps drop 100 times per minute and are given 7 to 8" drop; the discharge is from 6 to 8".

After running a mill two years on any ore, improvements naturally suggest themselves, so in this case, when the last ten stamps were added, they were set to drop 110 times a minute with 6" to 7" drop, and corresponding discharge. This has proved to be a move in the right direction, and has increased the efficiency above the old ten stamps; these latter will be set to the same speed shortly.

Water Feed to the Mortars.

The water feed as described by Mr. Bernard MacDonald, before the Canadian Mining Institute, has been introduced, and this, at least for these ores, is an advantage.

Mr. MacDonald's description of this method of feeding water to stamps has been followed in all the main features,—the only real deviation therefrom being that the inlet is raised 3" higher than he describes.

The writer is aware that this method of water feed has been criticised severely by some very able contemporaries, yet in the face of this he does not hesitate in stating that for an ore similar to the one in question it has much to recommend it, nor can he see any reason why it should not give continued satisfaction, and even less trouble than the old method of feeding the water above the stamps. Mr. MacDonald deserves the thanks of the fraternity for having so ably and fully described this stamp battery water feed.

Screens.

The screens used are 40 inch bur slot. These are watched closely as soon as they begin to open other screens are put on, and those taken off are closed with a little hammer specially made for this purpose, and in this way the same screen will do five to six turns of two and three days each, giving a fairly uniform product, well suited for leaching. Crushing through 40 mesh has been found to give best results; taking a sample of the battery pulp, nearly all the mineral will pass through a 60 mesh screen leaving the quartz on the screen.

The crushing capacity of this mill has been with the first ten stamps a little over 3 tons per stamp per 24 hours, or an average of 800 tons per month. The improvements on the new stamps have brought the capacity up to 4 tons per stamp.

Amalgamation.

Amalgamation inside of mortars is done on back plates and front chuck; the former is kept partially under the pulp and is protected by another plate 1½" above it, the chnck block is the usual shape.

Most of the amalgam is caught on the back plate, where it forms into hard lumps and ridges.

Very little loose amalgam is found on the mortars on clean up, and no coarse gold worth considering.

Great care is necessary in feeding mercury to the mortars,—a slight excess will soften the amalgam, when it is quickly scoured off by the very dense pulp, is broken up, and then issues through the screen in a very dirty state and is lost as far as amalgamation is concerned; in such cases it is, however, caught with the concentrates either in the trap or on the concentrators and finally saved in the leaching.

Too little mercury soon allows the amalgam on inside plates to become dry and hard, and a dirty film forms, when all further amalgamation ceases.

Owing to the extreme care necessary as above described, and the varying character of the ore as regards per cent. of Mispickel, and quantity of gold amenable to this method of amalgamation, no exact data can be giveu as to per cent. saved inside the mortars; but 20 per cent of the total assay value in the ore is fairly approximate.

Amalgamation on the apron plates must also be watched with unusual care, or the plates will soon show a dirty film, due in part to the fine Mispickel, which inclines to adhere to the plate like a paint, and which requires force to remove it.

The plates are six in number,—each 24" in length by the full width of the mortars and there is one inch drop between them.

The plates are set with an incline of 2¼" per foot; this is necessary to keep them clear, and even at this steep angle they will frequently clog.

As little water as possible is used so as to obviate the rapid motion of the pulp that naturally would occur over such a steep plate, and also to save the concentrators from an unnecessary amount of water.

The amount of water as compared with ore is necessarily greater for an ore of this kind than would be needed for an ordinary free milling ore. Heavy silver plating is best for this kind of ore; it has been found, that as soon as the silver is worn thin, the copper will show tarnish. This can be counteracted by building over it with gold; but gold in this case does not form as desirable an amalgamating surface as silver; the former will become hard and dry and soon ceases to work, whereas silver will retain a plastic surface. Owing to this, 4 oz. of silver per square foot of plate has been adopted, and with care in dressing the plates, this coating will last almost indefinitely. No cyanide is used except in extreme cases, such as after a long stop or when ores containing much free iron is being milled, in which case spots very much resembling grease will form all over the plates; these are best removed either by a weak solution of cyanide or preferably a little caustic soda. The plates are dressed every two or three hours, according to need; this dressing being done with a rubber

consisting of several layers of soft wool blanket fastened on a wooden paddle, and this rubbing is followed by a brushing with a whisk.

Under normal conditions, *i. e.*—when milling the regular Mispickel ores, a saving of from 50 to 62% is effected by amalgamation in mortar and on plates; the average for several months being 57% of assay value.

The gold is occasionally found free and fairly coarse, but this is the exception, close investigation having shown, that the gold is locked up in the Mispickel and in a very finely divided state; it is therefore necessary to crush fine to at least partially liberate this fine gold to fit it for amalgamation and subsequent leaching by Bromo-Cyanide.

Concentration.

The pulp on leaving the plates is passed through a suspended screen, hanging under lower end of table; here all stray pieces of coarse pulp that might escape from the mortars, when changing screens, are caught.

Below the screen and before reaching the concentrators, the pulp is made to flow through a trap; here any stray amalgam is caught.

These traps "one for each battery" of 5 stamps are cleaned out every 12 hours, the contents panned down and closely observed, and this serves as a good indicator of the work done in Mortars and on plates, and precautions are taken accordingly.

This may, in fact, be compared with a doctor feeling the pulse of his patient. The pulp from the old stamps passes over 6 feet corrugated belt Frue Vanners, one for each 5 stamps.

The tails from these two Vanners join in one launder and are allowed to flow into a series of hydraulic classifiers, 3 in all; here a partial separation is effected, and three grades of pulp are thus obtained, viz: coarse, medium and fines. Each of these products is run over a 6 foot smooth belt Vanner, and each of these Vanners is adjusted as to speed, inclination, travel and wash water, to suit the particular pulp flowing over it; in this way a very close saving is effected.

The average tailings from these second set of Vanners carry only 2 to 2½% of the original gold, and 0.5% of the Mispickel contents of the milling ore. The concentrates from the first two Vanners forming the bulk or approximately 75% of all concentrates produced, are shovelled into cars, together with those produced by the second set of vanners and thus become mixed.

The concentrates from two of the last named Vanners are very fine slimes. No water is allowed to leave the Mill, except what has passed over the Vanners. It was soon found, when stamps were first adopted under the present system, that the water, even when apparently free from sand, still carried a high value both in gold and per cent of Mispickel.

This loss has been checked very effectually by classification as above described, and by carefully adjusting each Vanner to suit the class of pulp passed over it. For the new section of the mill, Wilfley tables have been adopted,—one for each 5 stamps; the tails from these flow through one classifying cone, where all coarse sand is extracted and with a limited amount of water flows to a three deck Bartlett Table.

The surplus water from the classifier, still carrying some fine sand and all the slimes, flows to the three compartment classifiers and is treated with similar pulp on the smooth belt Vanners.

All concentrates are transported in side-dumping cars, to the leaching plant, where they are treated by the Bromo-Cyanide Process.

This part of the treatment I shall leave for my colleague, Mr. S. B. Wright, to describe, he being the chemist in charge of this department.

Special Features.

As special features or innovations from ordinary practice in milling of ores by stamps, the following may be cited:—

A high speed engine "Robb-Armstrong" tandem compound, is used, running at 235 rev. per minute.

This engine, together with the boilers, are in a separate building, and 40 feet from the mill building proper. The power is transmitted by a 4 inch shaft to the outside of the mill building, alongside which is a tunnel, through which runs the main belt connecting with the main countershaft of the mill.

The advantage of a high speed engine is a constant uniform speed for the stamps, which is a most important point. In the same building with this engine is another but smaller Robb-Armstrong engine, driving an alternating current generator, which is furnishing light for the whole plant.

All the concentrators are driven by a separate engine, and are thus independent of the rest of the mill machinery.

Starting at the top of the mill, may be mentioned the rock breakers, being set to crush very fine, thereby greatly aiding the stamps.

The high speed of the stamps with comparative short drop, gives a lively and continuous wave in the mortars and greatly assists the discharge of the heavy mineral.

The water being fed from the back and on a level with the dies also aids the discharge. Protecting the back plate may also be worth noting.

Using burr slot screens for greatest output which the writer believes is contrary to what is generally conceded.

The explanation in this case is that the pulp being very heavy, will keep the mineral particles suspended when thick, and will discharge uniformly when partially checked by a burr screen, hence the mineral has less chance of settling below discharge level, than if a free discharge was given such as a wire screen would afford.

Through the latter the thin pulp would flow more readily but would leave the heavy mineral behind to be still further crushed under the stamps.

Passing all pulp from the plates through a screen has an important bearing on the subsequent results of concentration.

The traps are not of much importance as amalgam savers—their chief value is as indicators of the work that has been done before the pulp has reached that point. This may only be true on ores of this class.

When pulp is normally of even mesh, say 40 mesh down to fines, the particles will concentrate together fairly well, but if a few particles of coarse material, such as will escape from the mortar when a screen is removed, be present also, each of these particles will stir up a turmoil on the concentrator and continue the agitation immediately around itself throughout its whole travel to the tail end, and will carry a corresponding amount of mineral with it, which would, had there been no such agitation, have been saved with the heads.

The importance of avoiding undue agitation when concentrating an ore much inclined to form slimes carrying high values is self evident.

Double concentration is very essential on these ores, no single concentrator would give clean tails.

Classification of the pulp between 1st and 2nd set of concentrators has a most important bearing on this after-treatment, in that it permits different adjustment to suit the pulp flowing over each particular machine, which could not be done to advantage on a mixed pulp.

The tailings from the second set of concentrators joins in one launder for each section of the mill leading out of the mill, but just before leaving the building these tailings are sampled by an automatic sampling machine acting as follows:—

The flowing pulp gives impulse to a little breast wheel suspended over the launder, this motion is communicated through gearing to a reciprocating arm, upon the end of which is a cup or spout.

This cup is made to pass across the stream automatically at regular intervals, "every 10 minutes," when it cuts out a very small but absolutely representative portion of the whole stream; this forming the sample, is led into a tub and allowed to accumulate for 12 hours' or the full shift.

This sample is collected for assay at the end of each shift, and thus serves as a check on the work done by the concentrators.

There is a sampler for each ten stamps—any trouble or careless work being thereby readily located.

It will readily be seen that careless work on the part of the workmen in the mill is at once detected, and taking the average of the tails sample, together with that of the ore sent to mill, it becomes easy to calculate what the mill is doing.

Construction.

As special features in construction may be mentioned the A battery frame.

This was ably described by Mr. R. W. Barrell in *Mines and Minerals* for November, 1899.

Mr. Barrell, however, failed to give the writer due credit for having developed this battery frame to its present state of perfection.

The writer has built this style of battery frame on several occasions, and can say without hesitation that it forms a most excellent frame, one that will stand the continued vibration of the stamps without detriment to itself.

The tables are 12 feet long and made in six steps of one inch drop between each.

These tables are securely fastened under the lip of the mortars and held to the battery frame by angle irons; the lower ends of the tables are resting in the tail box, which in turn is hung from the floor.

There is no intermediate support. This long span without supports is purposely made to permit the vibration from the stamps to be communicated to the plates, which is an advantage where pulp is made to flow rapidly over copper plates.

The milling plant is built in four distinct and separate buildings, viz: the power house built of brick and as already referred to, 40 feet away from the mill.

The stamp mill with its ore bins, and all concentrators.

The leaching plant below the stamp mill, but separated by 20 feet; this was done to prevent any vibration from the mill being communicated to the leaching tanks, the ore being very heavy and dense, could not stand anything that would tend to further compact it in the vats.

And finally the assay office and laboratory, which is 40 feet from the leaching mill and 20 feet from the power house—the four buildings forming a square.

This makes a very compact and convenient plant, and at the same time keeps each department distinctly to itself.

By Product.

The concentrates, after the extraction of their gold contents, are sent to the Arsenic works, where they are calcined for the Arsenic they contain.

The crude arsenic resulting from the calcination is in turn refined and produces white arsenic, "arsenious oxide" analyses—of which show 99 4 per cent. to 100 per cent. pure $As_2 O_3$ and is of a pure white color.

This is the only arsenic producing plant on the American Continent, manufacturing arsenic on a commercial scale. The production is 40 to 50 tons per month and this will be further increased shortly.

To fully describe all that has been tried and the many difficulties that have been overcome, one after the other, would be too lengthy and would not interest anyone—suffice it to state that, many of the little schemes seemingly trifling in themselves nevertheless when taken as a whole and in conjunction with the Bromo-Cyanide Process constitute the secret of the successful treatment of these very refractory ores to-day.

The Treatment of Auriferous Mispickel Ores at Deloro, Ontario.

By Sydney B. Wright, Deloro, Ont.

Before proceeding with particulars as to the actual treatment of the concentrates mentioned by Mr. Kirkegaard, a few words on the chemistry of the process adopted will the writer thinks, be in order although already fully gone into by Messrs. Sulman and Teed in papers communicated to the Society of Chemical Industry.

Briefly the process consists in:

(1). The "Extraction" of the Gold by the leaching of the finely ground ore with a dilute solution of Potassium Cyanide, to which is added a small quantity of a solution of a "haloid" salt of Cyanogen—Cyanogen Bromide.

(2). The "Precipitation" of the precious metal from this Bromo-Cyanide "liquor" by means of metallic Zinc.

(3). The "Clean-up" of the Zinc-Gold Slimes thus obtained.

In comparing the equation representing the solution of metallic Gold by the Bromo-Cyanide solution, viz: $3\ K\ Cy + Au_2 + Cy\ Br = 2\ (K\ Au\ Cy_2) + K\ Br$, with Elsner's well-known equation for the solution by Potassium Cyanide, $4\ K\ Cy + Au_2 + H_2\ O + O = 2\ (K\ Au\ Cy_2) + 2\ K\ O\ H$, it will be readily seen that whereas in the former case the reaction is one of "Cyanidation" only, the latter, as is now generally admitted, involves oxidation, a reaction, the disadvantages of which in the treatment of ores rich in Sulphur, Arsenic, etc., are apparent.

On this point and on the extreme activity of the Bromo-Cyanide solvent on the precious metals together with the method of application of the process, depends the successful treatment of these dense concentrates.

Plant.—The plant now in use, and which is placed in a two-story building below the Mill, consists of:—

Four Leaching Vats fitted with sand and pebble filter bottoms, and bottom discharge-gates.

Four Solution or "Liquor" tanks—on the floor above the leaching vats.

Three small Northey Duplex Steam Pumps for pumping liquors.

Three small "sump tanks," 40 gallon barrels, over which the steam pumps are so placed that by means of a float connected by a rod to a lever on a special type of throttle-valve the speed of the pumps is regulated automatically by the rise and fall in level of the liquors flowing into the sumps. Two 50 gallon barrels holding the Stock Solution of Cyanogen Bromide.

Precipitation.—One Sulman's patent "Cone" for the use of Zinc Fume or "Dust" as the precipitant.

One Settling box connected with same, but which will shortly be replaced by a small filter-press or other form of filter.

One Zinc box through which all drainings only from the vat charges are run.

Pipe Systems.—The pipe systems employed are so arranged that the liquor from each tank may be run to any leaching vat independently; similarly the systems fitted to the bottoms of the leaching vats run to the small sumps from which the liquors having percolated through the charge of ore, may be pumped to any of the liquor tanks desired.

In this connection it may be mentioned that each pipe-line run is painted with a different colour in order to obviate any chance of a mistake being made in opening or closing the cocks, for any particular run. Asbestos-packed cocks are used in all these pipe systems and have proved a great advance on the old iron "plug" cock for this work.

Clean-up.—The clean-up plant in which the Zinc-Gold Slimes, obtained in the precipitation of the Gold from the liquors by means of metallic Zinc, are treated, consists of :—

One "Acid-Treatment" Tank fitted with a hood and stack by which the obnoxious gases evolved during the acid-treatment are carried immediately out of the building.

One Settling-Tank, and *One* Filter-Tub into which the Slimes are run after acid-treatment and washing.

This, briefly comprises the whole of the plant used in the "Extraction" building and since the final smelting of the "Slimes" is carried out in the Bullion-Room attached to the Laboratory, the furnaces employed there will be described further on.

The actual treatment of the Vat charges may now be taken.

Treatment.—The wet concentrates, as received from the Mill, consist principally of Mispickel, some Iron Pyrites carrying small but varying quantities of Copper, and 15 per cent. to 20 per cent. of Quartz-sands The latter is taken over purposely on the "Concentrators" and plays an important part in rendering these dense concentrates leachable. In this connection it may be mentioned that experiments were made by the writer on the separate treatment of *three* grades of the "sized" concentrates but the results obtained were inferior to those which the mixed products gave.

The wet mass of concentrates, mixed to some extent in the concentrator room and transferred in side-dumping cars to the leaching vats, is therefore dumped direct into the latter and a small quantity of Caustic-Lime added.

Here a further slight mixing is given by shovelling and spreading occasionally until the vat contains a charge about three feet deep, or approximately 40 tons of concentrates.

The surface is now levelled off and the charge sampled.

The sample obtained by the usual method, viz., that of withdrawing a small quantity from each car-load by means of a pipe was soon found to be unreliable and was therefore abandoned. The method now adopted consists in taking drillings by means of a 2 inch auger—3 feet long—the entire depth of the vat charge.

The pulp thus obtained from twenty to thirty drill-holes is then well mixed, quartered down in the usual way, and is found to constitute a very accurate sample.

The charge is now submitted to a short Water Wash in order to get rid of the soluble "cyanicides" formed by the exposure of the moist concentrates to the action of the air during the filling of the vats, and this is the only preliminary treatment given.

After partial draining, or as soon as the water has disappeared below the surface of the ore, the cyanide solution or "liquor" is run on together with the requisite quantity of Cyanogen Bromide Solution. The original quantity of solution or "liquor," which for convenience may be called the "Strong" liquor, run on is, in all, approximately one third of the weight of the ore-charge—or thirteen tons. Formerly a Weak Cyanide Solution was run on previous to the above-mentioned liquor with the idea of reducing cyanide consumption. This weak liquor, however, was found to exert practically no influence in the latter respect and at the same time dissolved only a very small quantity of Gold. It was therefore abandoned and the length of treatment materially reduced in consequence.

The first mentioned liquor having been run on to the charge the water remaining from the preliminary wash, and now being replaced by the Bromo-Cyanide Solution, is run out through the Zinc boxes.

At this stage a somewhat radical departure from ordinary practice is made, and one which has proved a necessity in treating this refractory material.

It being the fact as in nearly all leaching operations that the first portion of the liquor to pass through the ore charge is extremely rich, comparatively, in the dissolved metal, a rapid and easy means of ascertaining the correct point at which to "switch" to the liquor tanks becomes necessary.

The usual "Silver Nitrate" test, though applicable in the treatment of most ores was found unsatisfactory in this case even in skilled hands, and since it frequently happens that such tests must be made by the workman in charge of the vats it will be readily understood that a simple and decisive test is an absolute necessity. It was found on examination that the very dilute solution first appearing through the charge, although extremely weak in free K Cy, contained an appreciable quantity of soluble "Ferrocyanides."

Advantage was therefore taken of this fact to apply the delicate "Prussian Blue" test, by adding "Ferric Chloride" solution to running samples drawn from the Zinc boxes. By this means on the first appearance of Gold-bearing solution a distinct Prussian Blue coloration is obtained and the operator knows at once when to switch to the liquor tanks.

The departure from ordinary practice mentioned above now takes place.

It consists in switching this very dilute (in K Cy) solution *not* to the *Weak* but to the *Strong* tank and as a further distinguishing point between Bromo-Cyanide treatment generally and ordinary Cyanide practice it may here be mentioned that this "Strong" liquor may be used, without any precipitation of the Gold by Zinc or other means, until it contains as much as 6 to 7 ozs. of Gold per ton of liquor if desired.

This practice although considered unsafe in many cases in ordinary cyanide work is perfectly free from danger in the Bromo-Cyanide treatment of this ore.

On the latter case it is also advantageous to precipitate the "Strong" liquor as seldom as possible, within the above-mentioned limits on account of the fact that by contact with metallic Zinc the Cyanogen Bromide is decomposed and the liquor thus rendered much less active.

To revert to the actual treatment of the charge—the "blue" coloration having been obtained and all the liquor having been run on, the solution now percolating through the charge is run to the "Strong" tank and is brought up to correct strength by the addition of the requisite quantity of K Cy.

Constant slow percolation of the liquor through the ore is found to render the solution of the Gold much more rapid than if soaking and percolation be adopted and for this reason the liquor is run back to the Strong tank, as stated previously, and is run on to the charge at intervals with the requisite quantity of Cy Br solution.

After twenty four hours' leaching it is found that 60 per cent. to 70 per cent. of the gold contents have been extracted and at this point it is advantageous to drain the charge, and turn the mass by shoveling in order to break up and mix any clots of fine mispickel which may be present, and thus expose fresh surfaces to the action of the Bromo-Cyanide liquor. The latter is now again run on and the leaching continued until assays of samples of the liquor show that the extraction is completed.

A weak "Wash" liquor is now run on to replace the "Strong" solution, the latter being run off at full bore of the pipe. As soon as the original 13 tons of Strong liquor have been collected the stream is switched to the "Weak" tank and a water wash run on to the ore.

The original quantity of "Weak" liquor used is collected and this collection is continued until a running sample of the washings shows on testing that the stream may be run out through the Zinc boxes. In this way it will be noticed, the quantity of Strong liquor in use is retained at the original 13 tons, while the Weak or Wash liquor is allowed to increase in bulk with each leach.

By this method the Strong liquor is refreshed with clean solution in each charge treated, and on the great activity of the Bromo-Cyanide solvent in conjunction with this retaining of the working solution in a clean condition depends largely, in the writer's opinion, the successful treatment of these concentrates.

The Weak Wash liquor, accumulated as above-mentioned, is used to wash several charges and is always precipitated ahead of the Strong solution so that when the latter is rich the former is practically free from Gold.

Precipitation of the Gold.—For this purpose Zinc Fume or "Dust" a bye-product obtained during the operation of Zinc smelting, is employed.

The Plant consists of an inverted cone of sheet-iron 4 feet 6 inches in diameter and of the same depth. This is fitted at its apex with a three-way cock and a small perforated cone or *rose*, which serves to distribute the stream uniformly, thus ensuring thorough admixture of the liquor with the Zinc Fume which is run in at intervals through a central funnel and pipe.

The latter is expanded at its lower end into an inverted funnel and by deflecting the stream of liquor helps to mix the "fume" and liquor still more thoroughly.

The liquor to be precipitated is run from the storage tanks into a 40 gallon barrel the delivery into which is fitted with a ball-cock in order to obviate any chance of overflow.

This barrel is connected with the three-way at the apex of the cone by a pipe and, being placed above the top rim of cone, serves to maintain a constant head. The liquor thus runs direct into the bottom of the cone and meets the Zinc fume just above the distributing rose. In the upward travel, however, of the solution the Zinc and Zinc-Gold particles descend again into the precipitation "Zone" by reason of the decrease in velocity of the currents with the increasing area; thus a *small* quantity of the "Fume" exposing, in proportion, an enormous surface of metallic Zinc to contact with the liquors serves to precipitate the Gold from a large quantity of liquor.

The precipitated liquor which, by the time it reaches the rim of the cone carries only a small quantity of suspended matter, now overflows into a peripheral gutter and thence to a wooden settling-box containing two compartments in which a number of glass plates 24 in. x 18 in. are placed at an angle of 45°.

Thence the perfectly clear liquor flows to the sumps and is again ready for use on the ore charge.

It may here be mentioned that the "settling-box" will shortly be replaced by a small filter-press or other convenient form of filter which will be used firstly, as a means of separating the small quantity of suspended slimes from the flowing liquors and secondly as a receptacle for the slimes withdrawn from the bottom of the "cone" when the precipitation "run" is completed.

The advantages obtained by adopting Zinc Fume as the precipitant, as compared with the older Zinc "Shavings," are briefly :—

(*a*). A closer and more uniform precipitation of the precious metal from the solutions, 99 per cent. of the original contents being the regular proportion thus obtained.

(*b*). The production of rich Zinc-Gold Slimes.

(*c*). Ease and rapidity of manipulation in clean-up.

(*d*). The rapid conversion of all the Gold extracted by the liquors into marketable bullion.

(*e*). The low cost for Zinc consumption.

Clean-up.—The Gold bearing precipitate, whether obtained from the Zinc-boxes or from the "Fume" cone is now treated with Sulphuric Acid in order to get rid of the Zinc present. This is carried out in a room adjacent to the Extraction building, all the precipitate collected during the month being treated in one lot in the Acid tank.

The strength of Acid used is approximately one part in ten parts of water.

The moist precipitate is placed in the Acid tank the requisite quantity of water added, the hood which is fitted with a small glass window front and back so that the action may be observed, closed down and the Acid run in through a leaden funnel.

The mass is stirred with a wooden paddle, the handle of which projects through a small opening in the front of the hood, and as soon as the first violent evolution of gas has subsided somewhat, more acid is run in. The stirring and additions of acid are continued until the reaction is seen to be complete. The tank is now filled with *cold* water, stirred well and allowed to settle. By using *cold* rather than *hot* water a more rapid settling of the Gold slimes is effected and after two further decantation washings the slimes are obtained free from Zinc Sulphate. All the washings from this are run into the Settling *tank* in which they are allowed to stand until thoroughly settled; the clear solution, which on assay shows only traces of Gold, is then run off and the small quantity of fine precipitate on the bottom of the tank collected.

The Gold-slimes in the acid tank are rinsed into the filter-tub as soon as the third "wash" has been run off and, after draining, are transferred to shallow sheet-iron trays. These are placed in a special form of oven-furnace in which the contents are first dried and finally heated to a dull red heat.

The furnace itself consists of a small wind-furnace, which is used for the melting of bullion and which is fitted with a hinged damper so that when required the trays containing precipitate may be heated by the *waste* heat from the furnace. This is effected by placing the trays on shelves in the oven one above another in such a way that the spaces between them form the flue through which the furnace gases pass to the stack.

By this means the objectionable vapours evolved during the roasting of the slimes are carried away and at the same time no loss by dusting is experienced on account of the large flue area allowed between the trays.

The roasted slimes are now mixed with a suitable flux, smelted in *clay* crucibles which for safety are placed inside graphite pots, and the smelt finally cast in the usual "brick" moulds.

The Slags obtained which are exceptionally clean are allowed to accumulate and are treated at intervals by Caldecott's process.

Although this paper has been confined to the treatment of one particular class of material it may also be mentioned that the writer has had opportunities for making comparative tests of the merits of the Bromo-Cyanide as compared with the ordinary Cyanide process in treating ores and tailings of various descriptions, and has found that with practically all the so-called "refractory" ores treated the best results both as regards cost and extraction have been obtained by using the Bromo-Cyanide process, the difference being sufficient in many cases to convert an uneconomical treatment into a profitable operation.

The following figures representing the chemical consumptions and extraction on the concentrates, in conjunction with the saving effected by amalgamation, speak for themselves :—

Potass. Cyanide per ton of concentrates treated.... 2.0 lb.
Cyanogen Bromide per ton of concentrates treated. 0.5 lb.
Zinc Fume per ton of concentrates treated..... 0.19 lb.
Total length of treatment.... ..... 80 to 100 hours.
Extraction of Gold from Contentrates 87 per cent. to 94 per cent.
An average of..... 90.5 per cent.

This latter with the values saved by amalgamation gives a *total* saving of 88 per cent. to 90 per cent. of the original Gold contents of the Milling Ore a result which, as an average of two years' steady work, will it is thought be generally admitted to be exceptional on so refractory an ore.

Shipping Coal by the Aerial Wire Rope System at Port Morien, Cape Breton.

By Joseph G. S. Hudson, M.E., Port Morien, C. B.

The designer of the aerial wire rope tramway, Mr. Roe of the Ropeway Syndicate of London, claimed for his system: that it was easily installed, economical in working, simple in operation, easily maintained when erected; and that it could be adapted to almost any practical working condition and that for the tons of material, it was capable of handling, the first cost was very small compared with the usual means of transportation.

In working the system we have found the designer's estimate correct and in the words of a gentleman who visited our works, recently, and who had a similar problem to solve "It is just the thing."

On the map shewing Port Morien harbour and where Gowrie and Block House Collieries, Limited, of Newcastle-on-Tyne ship their coal, it will be seen that the wharf marked Dominion Coal Co. pier extends out from the shore, to a point where the vessel had sufficient water to take in cargo practically one thousand feet from the shore at high water mark.

To attain this mark and build a wharf by the means, customary use in the district, meant at a very conservative estimate $25,000, allowing that the minimum depth of water at low tide was to be 14.0 feet, and from this point the wharf would have to be extended sufficiently for ocean steamers to load.

By adopting the aerial tramway system you commence your shipping pier in the depth of water you wish to obtain for vessels, can place support towers from 325 to 375 feet apart, between given points, and bring your wire ropes to the point where your coal is delivered from the screens, and so save to a very great extent, a large expenditure in labour and material in building.

Commencing at the loading station we have a small Jenckes engine with cylinder 9 inches in diameter and 12 inches stroke with a fly-wheel 42 inches in diameter, on this a four-ply 8 inch rubber belt on a 42 inch Dodge split pulley, which drives a two inch shaft to a geared bevel wheel 5 feet in diameter, which is placed horizontally on a 6 inch perpendicular shaft, immediately below is the rope wheel feet in diameter. The driving shaft making 14 revolutions per minute, this is nominally the motive power. The rope is one inch and one eighth in diameter ordinary Lang laid.

The driving wheel is situated at the near end of the loading station, in order to allow the shunt rail to extend further back than the loading point, so that sufficient room can be obtained to allow the empty buckets to come on the shunt rail, and radiate to the loading point and have enough space for standage room between the empty and full buckets. The terminal stations are built of 4½ inch by 9 inch scantling, uprights in concrete foot blocks. Bents 9.0 feet centres and 7.6 feet high on which is suspended by cast iron hangers a piece of steel 3½ inches deep by ⅝ inch thick; these pieces form the shunt rail. The carrier is so designed that it forms a clip on the rope, and is also provided with two wheels 6 inches in diameter, which come into operation when the buckets leave the rope at the terminal points, and are transmitted with the rope impetus to the shunt rail, both at the loading and unloading stations.

The buckets are of pressed steel and carry 850 lbs. of coal. It has been demonstrated by practical working that an excessive weight in the buckets causes a much heavier and expensive plant, and that the better method is to move a small load quickly and often than a heavy load slowly; for example it was the original idea to have 5-ton loads, but now it can be demonstrated that ten buckets will carry five tons nearly in the same time and can be distributed a bucket every 200 feet along the entire length of rope, and attain the same quantity of material carried in the same given time.

When the bucket is filled at the loading station, the operator simply gives the loaded bucket a shove, the wheels on the carrier running along the shunt rail until it comes in contact with the moving rope, which conveys it along at the same speed as that which the rope is moving. One hundred feet from the loading station is a tower 11.0 feet high with a cross arm of sufficient length to spread the rope apart, so that the loaded bucket going out on the full rope will not come in contact with the empty bucket returning on the other rope travelling in the opposite direction on which the empty bucket runs.

On all these towers are suspended by means of self-moving bracket arms four wheels in line on the full side and two wheels in line on the empty side.

These wheels are so balanced that they dip down to accommodate the sag of the rope when the bucket approaches the support tower, and make a return dip, when the buckets go with the sag of the rope from tower to tower.

When the loaded bucket arrives at the pier, by looking at the side view of the pier, it will be seen that a platform extends out over the end of the pier. On this are arranged a series of receiving wheels in front of the shunt rail.

When the loaded bucket arrives the man operating the pier end runs the loaded bucket on the shunt rail until he comes to the place in the pocket where he dumps the coal, lifts up the latch, the bucket on a gudgeon, tips over, and returns, he then closes the latch, runs the now empty bucket round the radial end of the shunt rail, and gives it a good hard push, the wheels on the carrier run along the shunt rail until they come in contact with the rope (which has gone round the tension wheel) the clip then comes into operation, and the bucket is both suspended on the rope, and is carried along, passing the support towers, and arrives again at the loading station. I mentioned before that the wharf was situated 1,000 feet from the shore, and that the loading station is 200 feet further to the pit mouth and the screens: the time occupied by a loaded bucket leaving the loading station travelling out to the wharf, being unloaded, shoved round the shunt rail on the wharf, and returning to the end of the shoot to be reloaded is ten minutes.

The capacity of the system guaranteed by the makers, is 50 tons per hours, but this I am sure can be exceeded, but when we asked for estimates, that is the quantity we specified, and the makers advocate duplicating the plant, rather than make one to carry twice as much, but this is a matter which can be arranged with the maker. We operate our system having a small boy to watch the engine, in case of any accident occurring, or an uneven distribution of the buckets (the rope having a tendency to race if the loaded rope gets too many loaded buckets placed on it in a short space).

One man at the loading station filling the buckets from the mouth of the screen, and one man on the wharf to unload the buckets, and run them round the shunt rail, and put them on the return rope, as already described, also to see that the wheels are kept greased and running all right.

We weigh the coal in the buckets by one of Fairbanks A scales, suspended on a section of the shunt rail.

The pier is designed as follows, viz. :—The first one hundred feet to contain four pockets of 90 tons capacity each, for loading schooners with a draft of water up to 14 feet at low tide, 200 feet now being built for the steamer section and having a storage capacity of 800 tons, there being from 18 to 20 feet of water at low tide along this section, plus four feet for high tide.

The tension on the ropes is with a capsan and thread bar, the tension weight being three tons, can be multiplied four times, giving a tension if required of 12 tons; but this we have not found necessary the ropes running most satifactorily, having considerable sag in the ropes between the towers.

On this coast we have heavy gales, and I anticipated considerable trouble, thinking that the buckets might swing on the ropes, and strike against the support towers, but in the heaviest gales last autumn, we ran the buckets both empty and loaded, and had no trouble whatever with them.

The whole system realizing our fullest expectations, and obliterating any idea that the shipping of coal by the aerial ropeway had any similitude of an experiment but demonstrating most successfully that it was a sure thing and just what we wanted.

Rope Driven versus Direct Driven, Colliery Ventilating Fans.

By Francis T. Peacock, M.E., Montreal.

There is a difference of opinion among Mining Engineers and Mine Managers as to whether a Colliery Ventilating Fan should be coupled to the Engine direct, or driven through the medium of a Belt, Cotton, or Hemp Ropes, and the writer wishes to call attention to some of the conditions which should determine a selection of the type to be used.

The following may be taken as the principal features requiring careful consideration.

1st. Colliery Ventilating Fans must generally run continuously, night and day, including Sundays, unless of course duplicate plants are installed, enabling one to be stopped for repairs, if necessary, which, however, entails double outlay.

2nd Taking into consideration the continuous running required of this Machinery, it is of the utmost importance that the speed of Driving Engines should be very moderate, to insure freedom from breakdown. Considering the hours worked during the week, Mill Engines run only one-third the time of Fan Engines; or, in other words, each year the work done by Ventilating Engines, represents three years work, as compared with Mill or Factory Engines.

3rd. Ventilating Engines should be of the simplest design with ample wearing surfaces, as being less liable to get out of order; consequently the ordinary Slide Valves provided with adjustable cut off Valves, variable whilst the Engines are running, are particularly adapted for Fan Engines.

4th. The Engines should be arranged in duplicate, so that if a breakdown occurs in one, the other may be quickly coupled up to the Fan, meanwhile the disconnected Engine can be overhauled and again put into good working order.

5th. Both Fan and Engines should be of ample size to effect the required ventilation easily when the Steam Boiler Pressure falls below normal, which even in the best regulated plants, will sometimes occur.

6th. Assuming that the Fan is so designed that it will easily perform its rated duty at a certain speed, the designer must consider whether it is better to install a larger Fan and drive it by means of direct connected Engines, or to install a smaller Fan, and drive by means of Ropes or Belt. This question, however, applies more to Fans of high Water Gauges and large volumes.

7th. The Plant should be an efficient one in Steam consumption, and this fact is now recognized, even at Coal Mines, where fuel is at its cheapest.

DIRECT DRIVEN FANS.

This type of Fan is very often preferred, principally, I believe, on account of its lower first cost. While a Direct Driven Fan may be considered as satisfactory for low Water Gauges and small volumes, it has a number of disadvantages for large installations, which become serious for high Water Gauges, among which the following may be mentioned.

To give the required periphery speed to the Fan, the Engine must either be provided with an abnormally short stroke, or must be run an abnormally high Piston velocity. A high Piston velocity is very objectionable in such continuous running Machinery, and it is found that the destructive effect lies not so much in the speed at which the Piston travels, as in the frequency of its change of direction.

A Direct Driven Fan must often be larger in diameter for a given duty than would be the case if the Fan were geared in order to reduce the number of revolutions and obtain the necessary periphery velocity. This means a heavier Fan, additional Foundations and additional weight on the Bearings.

There is generally considerable vibration in the Shafts of Ventilating Fans, caused in some cases by improper balancing of the Fan, and by reason of each Fan blade as it passes the opening to the outlet or chimney, being suddenly released from pressure or load. Taking the work of one day of 24 hours, and a moderate sized Fan with 8 blades running at 80 revolutions, a load of several hundred pounds, is, as it were, instantaneously removed from the blades 921,600 times.

The Shaft is consequently subjected to continual vibration, which is of course transmitted throughout the Engines, and which principally accounts for the fact that an Engine driving a Fan direct coupled of only moderate size, is almost invariably subjected to a hammering or knocking in its Shaft Bearing, Crank and Crosshead Pins, requiring a frequent adjustment of the working parts.

The breakages of large Fan Shafts, which have occured in Europe, after their elastic limit has been reached and the loosening of Bolts or Rivets in the Fan proper, are attributable to this vibration.

In Direct Driven installations, there are usually three Shaft Bearings, one on each side of the Fan proper, and one for Engine Crank Shaft There is a difference, not only in the dead weight, which these Bearings have to support, and consequently a difference in the amount of wear, but they tend to wear in different directions, and in consequence it is a most difficult matter, if not practically impossible, to keep all Bearings in proper alignment, and prevent knocking. This feature is not improved by reason of the natural deflection of the Fan Shaft, which is also liable to affect the alignment of Engine Crank Shaft, and consequently, the Crank Pin.

A Single Engine is of course not economical, as compared with a Compound Condensing Engine, and before the introduction of the Rope Driven Fan in England, it was customary in large or important installations, to equip the Fan with a Direct Driving Tandem Compound Engine on one side, and a Single Engine on the opposite side of the same end of Fan Shaft, with its own connecting rod connected at Crosshead end, the Crank end being suspended ready to attach to the Crank Pin in case of an accident to the Compound Engine. The Fan is in this manner provided with two separate Engines, with the exception of the Crank Pin. If this should break or become loose, the Fan must stop.

One of the advantages of the Direct Driven Fan in addition to its lower first cost, is that it requires less room and a smaller Engine

House. This, however, is not always important, for the reason that the Engine House may often with advantage, also contain other Machinery, such for instance, as an Electric Lighting Plant.

As the writer has previously pointed out, Direct Driven Fans are suitable, and often satisfactory, for low Water Gauges and small volumes. When this system is adopted, however, VERTICAL, and not HORIZONTAL Engines are preferable for the reason that the Vertical type of Engine will better withstand the Higher Piston velocities, vibrations and strains to which all Direct connected Engines are subjected.

BELT DRIVEN FANS.

Belted Fans are objectionable, except for very small capacities or temporary installations, on account of their liability to give trouble and annoyance with Belts stretching or breaking, when applied to this class of continuous running Machinery.

ROPE DRIVEN FANS.

This system of driving Ventilating Fans, now long in use in England, has for the larger and more important installations of that Country of deep Mines and intricate Ventilating problems, taken the place of the Direct Driven system, especially for high Water Gauges and large volumes. Rope Driven Fans have the following very obvious advantages :—

The Engines can be run at a very moderate speed, and long strokes can be adopted, thus considerably lessening the frequency of change of direction of the reciprocating parts, consequently adding length of life to the Machinery and minimizing the liability to breakdowns or stoppages.

The Fan being driven through the medium of separate Endless Cotton Ropes, (usually 1⅝" or 1¾" dia.) any vibration in the Fan itself, and the somewhat impulsive action of the Engine is practically dissipated through the elastic medium of the cotton ropes. Assuming the installation is geared at about 2½ to 1, the Engine passes over its dead centres only ⅔ as often as in the case of a Direct Coupled Engine, and in the case of Twin or side-by-side Compound Engines, with Cranks set at right angles, the Driven Pulley receives only a comparatively light impulse at each four points in a revolution, instead of a heavy impulse at each two points in a revolution, all of which conduces to very smooth running, long life, and a minimum cost for repairs.

The Fan Shaft runs in its own Bearings, independently of the Engine.

It is sometimes found that after a Fan is installed and has been running for some time, it is very desirable, owing to the varying circumstances of the Mine, to change the velocity of the Fan. Such a change, within certain limits, can readily be affected in Rope Driven Fans by changing the diameter of the Driven Pulley on the Fan Shaft. This is a great advantage of this type of Fan, and has often been taken advantage of by Mine Managers and Engineers.

In the case of Single or Tandem Compound Geared Engines, there is of course only one Crank Pin, as in the case of Direct Driven Fans, but when the Engines are of the Twin or side-by-side Compound type, and they are provided with a system of Valves to allow of the high pressure or low pressure side running alone or independently and of live steam being admitted to the low pressure Cylinder, which is provided with a relief and reducing Valve, we have two Crank Pins and practically two Engines, so that if an accident should happen to the H P. side, the L. P. side will temporarily drive the Fan, and vice versa. It is of course true that one side of the Engine will not drive the Fan to the same capacity or as economically as the Compound Engine, but if the Plant is properly designed, so as to easily perform its rated duty, one side of the Engine will drive the Fan to so nearly its full capacity, that practically little or no convenience results in so driving, temporarily.

It may be considered an objection to introducing the Rope Drive between Fan and Engine in that, by so doing, an additional factor of uncertainty is added in the Ropes, and that some power is wasted in Rope Transmission. In answer to these objections, experience has proved that by carefnl selection of the best makes of Cotton Ropes, and proper attention, they will run continuously for years without giving trouble. If one of the Ropes should give away, (which is a very rare case if the load which each Rope is designed to carry is not too great, and ordinary care is taken), the Fan can be run by the remaining Ropes until such a time as another Rope can be spliced and applied.

With reference to the power wasted in Transmission, with Pulleys of proper size there is practically no slip of the Ropes in the grooves, and with well designed and well finished grooves, the power required to bend the ropes around the pulleys and to pull the Ropes out of the grooves as they leave the Pulley, is so small that it can be practically almost neglected.

One of the advantages of a well designed and well constructed Rope Driven installation is, that on account of the moderate speed of the Engines and comparative freedom from vibration, less expense is required, not only for repairs and adjustments, but also in the smaller amount of lubricating oil used.

The object of this paper is to call attention in a general way to the advantages and disadvantages of the different methods of driving, only, though I hope to supplement this paper with others dealing with Ventilating Machinery, which is of such vital and increasing importance to modern Colliery Plants.

Across the Pitch versus Up the Pitch.

(*Continued.*)

By O. E. S. WHITESIDE, Anthracite, N. W. T.

In concluding a short paper written for our Annual Meeting in March, 1899, and entitled "Across the Pitch versus Up the Pitch" I suggested the possibility of a continuation later on.

Summing up the arguments advanced in this paper, and arriving at a general conclusion, I would say that the former is to be preferred in seams containing any amount of refuse that ought to be gobbed inside the mine; and the latter for seams containing little or no refuse, or where the whole product of the seam is to be shipped to the surface, and more especially if the seam is a thin one. In some instances there will be exceptions to this rule however. If it is absolutely necessary that pillars be left standing, it is possible that a fairly dirty seam should be worked "up the pitch"; while, on the other hand, if it is impossible to get miners used to that class of work, it would then be necessary to work a very clean seam "across the pitch" even though it were a thin one.

A seam containing in descending order:—

	FEET.	INCHES.
Mining	0	6
Coal	2	0
Slate	1	6
Coal	4	0
Mining	0	6
Total	8	6

and pitching at 35° to 50° ought, according to the general rule, to be worked across rather than up the pitch; while one containing in descending order:—

	FEET.	INCHES.
Coal	3	1
Mining	0	3
Total	3	4

ought to be worked more profitably straight up the pitch.

In the first example it would be much better, in the majority of cases, to adopt a system lending itself readily to the gobbing of waste inside, and this could not be done either so well or so cheaply if worked "up the pitch". In the second example the very small amount of waste gives ample mining, and is easily taken care of while driving to the rise, and, furthermore, being so thin it would be impossible to get a breast-car of any size in to work it, by the other system, without shooting rock. This could not be the case in any dirty seam containing enough coal to be workable.

Coming to the work in the broken the first requisite to the successful continuation of "Across the Pitch" work is to follow up immediately by pulling the pillars. If the coal is hard and does not contain many slips, and there does not happen to be another seam close by, these pillars may stand for a considerable period; but before the boundary is reached, even in a very small mine, they are sure to commence dropping coal on the low side, and once this starts it is a very short time before a great deal of coal is buried and lost, and the pillars left in very bad shape for pulling. If the seam is a thick one the effects are more marked, and, if a thin one, the roof and floor come so close together in the breasts worked out that, in order to get a breast -car in on the low side of each pillar, rock work has to be resorted to. This in conjunction with the opening of old chutes caved in, may make the pillars cost more than the work in the solid, while the percentage of waste will be greatly increased if the broken work does not immediately follow the solid.

Pulling the coal advancing requires little or no extra expense on chutes already in for the solid work; the roads are easily gotten in to the back end of each pillar; and the pillars are in an easy and safe condition for mining, but it is of course absolutely necessary that air holes be kept to the surface, or return air way in advance of the pillar pulling, and in troubled ground like that generally met with in the class of mining here referred to, these are often expensive items.

Throughout these operations the pillars should be pulled in regular steps the upper ones in advance of the lower, but not far enough to produce falls of rock that would cover the ends of the lower pillars and thus shut off the ventilating current. The coal from the breasts is of course all dumped into what is termed the outside chute, but that from the pillars should be put in the inside chute.

The track for the breast-car is laid on the high side of each breast on top of the "Gob" and just below the pillar, and, when the end of the pillar is reached, the coal is attacked and taken back, the distance to push the coal becoming less and less until the pillar is completely out.

In badly troubled ground the air-holes kept in advance of the pillar-drawing will not always be straight up the pitch, as it will often happen that the shortest way through the fold will not be directly to the rise, and, on this account, it is often necessary to modify the system previously adopted, in the vicinity of certain folds.

The three systems of work adopted in the thin coal seams of Belgium "gradins renverses", "tailles montantes" and "tailles chassantes", are merely variations of long-wall work adopted on account of the thinness of the seams, but, in so far as the direction of the working face is concerned, they include "Across the Pitch and Up the Pitch" work.

The first and third are across the pitch while the second is to the rise The second and third cover fully the two systems I have previously described, both as regards the direction of the working face and the pitch of the seams, yet the question of the thickness of the seam, or the amount of waste contained in it, seems to have been a secondary consideration to the degree of pitch in the evolution of systems, probably because their seams are more uniform in thickness and also in the amount of waste they contain. The degree of pitch is certainly a very important feature in the choice of a system, for, if it is heavy, the coal from the face falling on the waste below (if there is any) is lost to a considerable extent, and, as I pointed out before, especially is it important if the miners are not skilled in that class of work.

In the highly inclined seams of Pennsylvania and the Pacific Coast the miners are exceedingly skilled at this class of work, and many of them prefer to drive up the pitch no matter how steep the inclination may be. In the state of Washington they also invariably drive to the rise partially for this reason, and partially on account of the fact that many of their seams (containing enough dirt to recommend "Across the Pitch" work) are so soft, and at the same time lively, that "Across the Pitch" pillars cannot be kept in, even while the solid work progresses.

On a very easy pitch of from 12° to 30° the Belgians drive up the pitch and, as a rule, on slightly heavier pitches of 30° to 45° they drive across although the latter is used in some instances on pitches varying all the way from 0° to 60°. The system entitled "gradins renverses" is similar to overhand-stoping of metal mines and is adopted on the heavier pitches of from 45°to 90°.

In several instances in the state of Washington they have adopted a system for seams pitching from 45° to 90° which is neither across nor up but "half on" and locally termed the "Chute and Pillar" or "Diamond" system.

The gangways are driven first in the direction of the strike, and the chutes straight up the pitch, far enough to form gangway stumps are connected at the top by horizontal cross-cuts. From here up these chutes are continued not straight "up the pitch" but "half on" so that, on a seam pitching at 90°, the pitch of the chutes would be 45°.

These angle-chutes, as they are termed, are connected at intervals by angle-cross-cuts driven at right angles to the angle-chutes, their pitch being also 45° on a seam pitching 90°, but in the opposite direction to the pitch of the chutes. All these places are driven narrow and generally so as to form square pillars diagonally across the pitch, thus getting the name "Diamond" system. While the newer angle-chutes are being driven, the older ones immediately behind are being widened out and cogs placed on both sides, the work being started at the top and continued downwards, and the pillars immediately behind these are being pulled and the upper ones first.

The chutes are either driven to the surface or to a counter-gangway and the timber needed is lowered down them. Under certain conditions this system is an excellent one, and the coal gotten out very cheaply; but it can only be used advantageously when the breakage of the coal is of little account and where it is not necessary or feasible to store waste inside the mine.

If the coal is to be converted into coke, and the refuse of such a nature as to be best taken care of by means of a washing plant, it is an exceedingly profitable system.

It is very much safer for the miner than "Up the Pitch" work, and there is no extra labor in the cross-cuts shoveling coal, their pitch being thes ame as that of the chutes, all the coal mined gravitates to the gangways.

The size of the pillars and the number of cogs necessary are mere matters of detail to be determined by local conditions, such as the strength of the walls the thickness of the seams &c., &c.

Briquette Manufacture.—A new method of manufacturing briquettes has been invented by Mr. Alex. E. Tucker, of Birmingham, and Mr. Colin Cory, of Swansea. The advantages claimed for the process are that it is applicable to every kind of coal, and that when anthracite is used, it produces a fuel absolutely free from smoke. The cost of production is said to be much less than with pitch-made fuel, and the briquettes do not soften when heated. The preliminary trials of this fuel have proved so satisfactory that a syndicate has been formed and works are now being put down in South Wales, after which it is proposed to establish others in Staffordshire and other coal-producing localities.

The Coal Creek Colliery of the Crow's Nest Pass Coal Co.

By C. V. Corless, Montreal.

[Paper read before the March meetings of the Canadian Mining Institute.]

The coal-fields of the Crow's Nest Pass Coal Company lie just beyond the Crow's Nest Pass over the continental divide at a distance of about forty miles from the international boundary. They front on the Elk River, being situated in the most south-easterly mining division of British Columbia, that of Fort Steele.

The mines of the Coal Creek Colliery are situated in Coal Creek Valley, five miles east of Fernie, a town at the confluence of this stream with the Elk River. They are at an altitude of 3,800 feet above sea-level and 525 feet above the town-site of Fernie.

The measures have the usual rolling character of all Rocky Mountain coal seams. Their general line of strike is approximately north and south. Their dip varies from level to about 20 or 25 degrees, the rise being toward the west. The outcrops are, therefore, along the mountain sides to the west, at varying heights.

The mines, Nos. 1 and 2, are situated respectively on the north and south sides of the valley, about 1,000 feet apart. Though relatively on the same level, the mines are not opening up the same seams, as shown in the accompanying geological section.

Old No. 1 Tunnel, on the north side of the valley opened up the lower six-foot seam shown in the sketch, but this seam has been abandoned for the present, the tunnel being used as a return air-course for No. 1 Mine. The new No. 1 Tunnel is working an eight-foot seam of excellent quality. This seam is the top section of the thirty-foot seam, shown in the geological section, and is situated about fifty feet above the original six-foot seam.

No. 2 Tunnel, on the south side of the valley, has opened up the upper portion of the eleven-foot seam shown in the section. The upper six feet is being extracted. The under five feet, constituting the pavement, is alternating bands of coal and shale. This forms, generally, a splendid floor. The roof of this mine is of great strength and regularity.

Geology.—These coal measures occur in the Laramie Formation of the Upper Cretaceous series of rocks. In this district this formation comprises some thousands of feet of alternating bands of conglomerate and sandstone, the single strata varying from a few inches to hundreds of feet in thickness. At frequent intervals in these strata, but always immediately beneath a layer of sandstone, occur the coal seams with their accompanying carbonaceous shales. The enclosed geological section for which the measurements were made by the writer, while engaged at this colliery during the summer of 1900, shows the arrangement and thickness of the near lying strata at the Coal Creek Colliery. It would appear that the strata of conglomerate were laid down along an ancient sea-beach that oscillated back and forth owing to the repeated, alternate elevations and depressions of the Laramie Sea-bottom, the coal-beds marking long periods of small emergence and persistent marshes in the alternating changes of level. The Valley is glacial.

"The cretaceous," says Dana, "was the coal period of western America." To what extent this district was favored during the period of coal making, may be gathered from the following quotation from the December number of *The Colliery Guardian*, 1900 :—

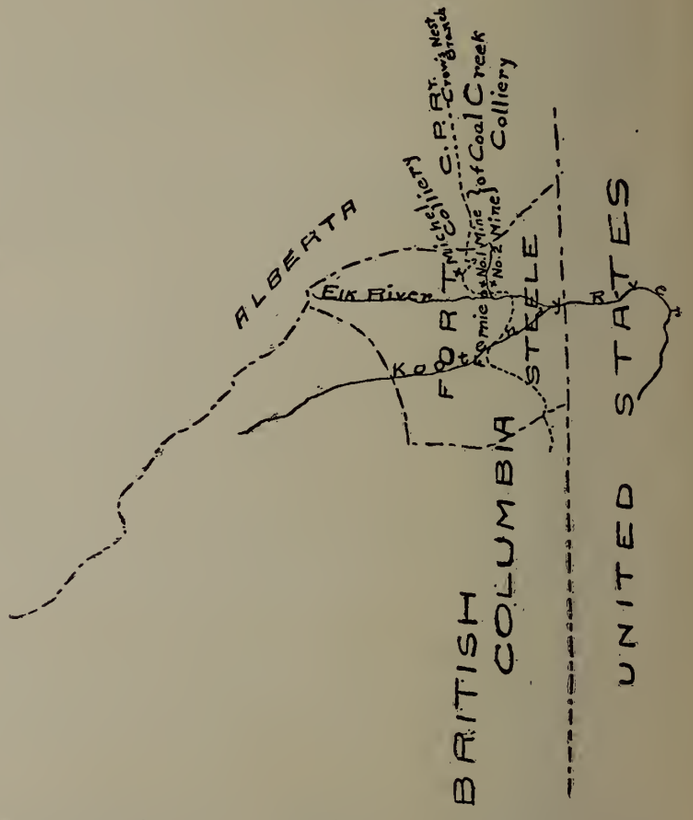
"In Crow's Nest Pass there are twenty seams of bituminous coal, three of which are 15, 20 and 30 feet thick respectively. The aggregate thickness of the seams reaches the large total of 132 feet of coal, and the area of the field is 144 square miles. This area is estimated to yield 50,000,000 tons of coal per mile and promises to be one of the most productive coal-fields of Canada." This estimate is very conservative, as the area is officially reported to be 250,000 acres or about 400 square miles, with seams aggregating 150 feet in thickness. The estimates of some engineers place the quantity of coal within this area at 25 billions of tons, which would admit of an output of 25 million tons a year, or 70,000 tons a day, for 1,000 years. Doubtless, the use of the diamond drill in the valleys, would reveal many as yet undiscovered seams. The coal in the seams exposed up to the present, is very uniform and of excellent quality. It is said to be the best coking coal in America, the coke possessing high Calorific power and great crushing strength, two most important qualities demanded of coke that is to be used for smelting.

The coal mines of the Crow's Nest are well situated for furnishing coke to smelters. But smelting is only in its infancy in southern British Columbia, there being at present 5 establishments, one at Nelson, one at Trail, one at Pilot Bay and two others in the Boundary Country.

Situated as it is, with vast metalliferous deposits to the south, west and north, the importance of this inexhaustible supply of smelting fuel, in the development of the "Great West," can hardly be overestimated.

The relative positions of Nos. 1 and 2 Mines, and of each to the surface plant, will be made clear by referring to Photo No. 1 and to

Plate I.



the accompanying plan of the mines. In order to concentrate the surface labor and shipping plant the mine tunnels are connected by a trestle forty-five feet high above Coal Creek. The Weighing and Sorting Building is placed upon the trestle equidistant from the mine entrances. This building contains the scales, Mitchell tippler for dumping the mine-boxes, shaker screens, travelling picking-table, engine for the screens and picking-table, and loading arrangements to facilitate shipment in railway cars (See Photo No. 2).

In both mines the coal is being extracted on the "pillar and stall" system, the seams being too thick to be successfully worked by "long-wall." The main levels and headings are driven 12 to 14 feet wide and the rooms or stalls, about 18 feet wide. The stalls are driven parallel as far as the undulations of the strata will permit and are connected by cross cuts at intervals of 50 or 60 feet. This is done in order to short-circuit the air and dispense with the temporary brattice.

General View Surface Works looking North towards No. I Colliery.

Weighing and Screening Building.

Jeffrey Electric Motor at Entrance to No. II Colliery.

General View of Coking Plant at Fernie, B.C.

Coke Ovens at Fernie in course of construction.

Coke Ovens being constructed.

The Lorry.

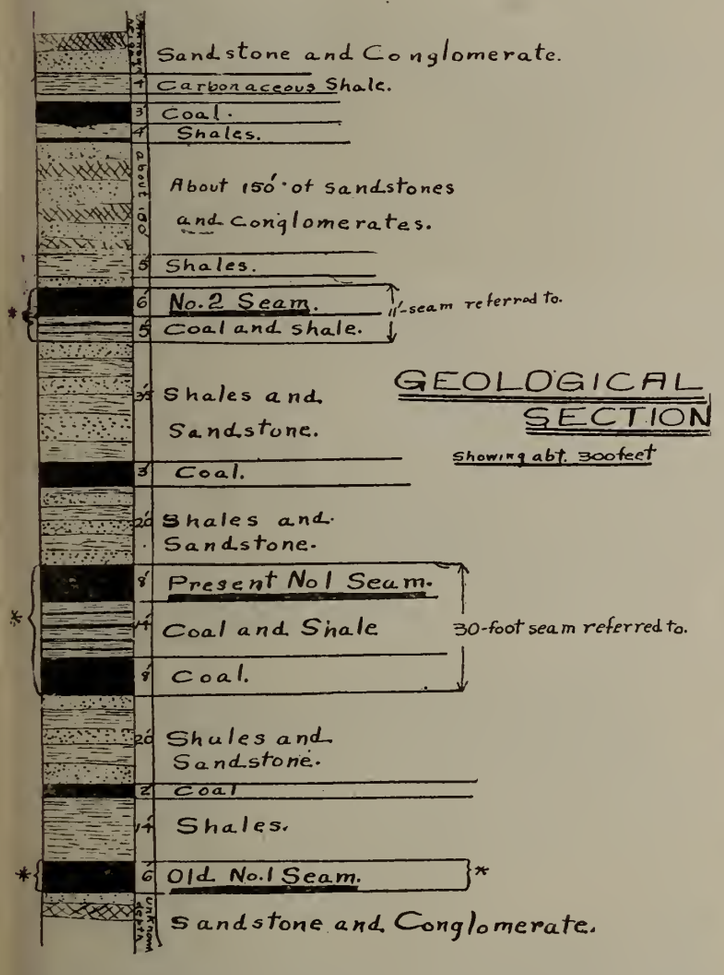
Slack Bin.

As will be seen from the plan, owing to difficulties in haulage arising from undulations of the mountain strata, the pillars are somewhat irregular both in size and position. They are, in general, about 45 feet square and are being increased in size as the workings extend north and south into the mountains which rise precipitously above the mines to the height of about 2,000 feet. This increase in size is in order to prevent a crush of the pillars or a creep in the overlying strata resulting from the enormous superincumbent pressure. It is not probable that any of the pillars will be robbed until all easily accessible, overlying seams have been extracted.

In order to stop a creep, should one occur, it may become necessary to rob a section of five or six hundred feet square and allow the roof to settle.

Though two electrically driven coal-cutting machines were purchased, they were in use only a short time owing to the excessive dip

PLATE II.



and rise in some parts of the mines. At present all cutting is done by hand. Much of the coal can be easily brought down by means of the pick alone, after the usual under-cut has been made. In gassy rooms the maul and wedge are used to bring down the coal when digging is difficult. But in rooms in which naked lights are used, after the under-cut has been made, the coal is blasted down by means of No. 2 or 3 black powder. The amount loosened by a good shot is 1 to 3 tons. The average consumption of powder is 1 lb. per 5 tons of output. A shot-lighter has charge of the placing and depth of all holes and of discharging all shots.

The rate of work is about eight to fourteen tons per pair per shift of eight hours, in wide work. In narrow work in a six-foot seam a pair averages about one yard per shift.

HAULAGE.—The undulating character of the seams renders haulage a difficult problem in engineering.

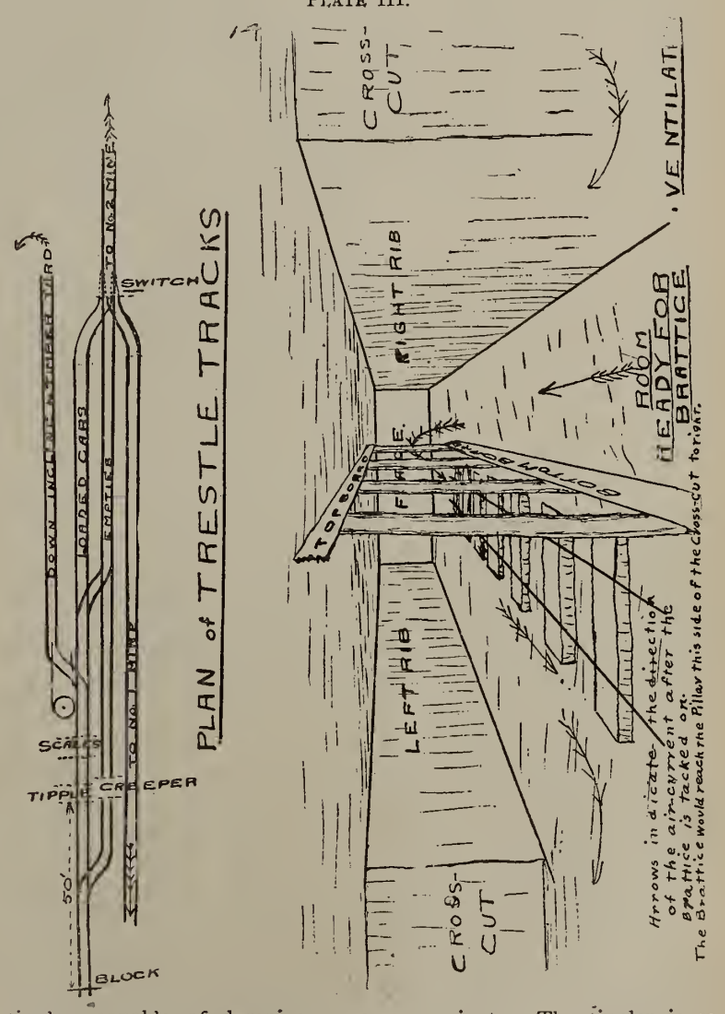
The main haulage is operated for about 2,000 feet by an electric motor in each mine. The grade of the motor tracks is 2 per cent., rising inwards as far as the first bend in the main haulage road, shown in the plan, after which it is variable. In No. 2 mine the main motor haulage was extended 600 feet by means of an electrically driven stationary hoist. The grade of the track for the hoist varies from 15 to 20 per cent. being too steep for the motor. The hoist is geared to give a cable-speed of two miles per hour. The secondary haulage in each mine is by horses and is under the superintendence of a driver boss in each. The driver boss remains at the landing and oversees the coupling and starting of the motor trips. Each driver hauls, on the average, about 40 boxes per shift, from four working places to the landing—a distance not exceeding 300 feet. It is found to be bad economy to let the round trip for a horse exceed 600 feet.

The arrangement of tracks, switches, scales, tipple and creeper are shown in the plan trestle tracks (See Plate III).

Two men are required on each motor, a motor man and a conductor. These haul the trip from the landing in the mine, out upon the trestle, and switch it on to the weighing and dumping track, returning with empties. The loaded cars are now uncoupled and pushed forward on the scales by a bankman. A tally-boy removes the tally and reads the miners' number to the weighman, returning the tally to its proper place on the tally-board. The miners have availed themselves of their legal right to appoint a check-weighman who overseers the weighing and checking of each box.

After being weighed, the cars are dumped by means of a Mitchell

PLATE III.



tippler, capable of dumping 10 cars a minute. The tippler is so arranged that the following cars release the wheel-grips of the empty car in front, which then runs down a 5 per cent. grade for a distance of 50 feet, and then switches automatically back on another track,

falling 5 per cent. for the same distance, to the side of the tipple. From this point, reached by gravity, the car is pushed by a creeper up a 15 per cent. incline, to a sufficient height to permit it to run forward, under the action of gravity, on the empty track ready for attaching to the next return trip.

Difficulties.—Owing to the thickness of the seams being worked, there has been no necessity for "brushing" the roof for haulage-roads in either mine.

In No. 2 Mine there have been a few cases of heaving of the floor but these have so far caused but little trouble, being of no great extent.

On the other hand, the undulating character of the strata causes, even on the general line of strike, some very steep grades, which it is practically impossible to overcome by horse-haulage. The haulage on these parts, between the rooms and the landings, presents a series of difficulties which it will tax the utmost skill of the engineer economically to overcome. As already mentioned, one of these long 15 to 20 per cent. up-grades is operated by an electrically driven stationary hoist. A second 20 to 25 per cent. down-grade in No. 2 Mine, is operated by gravity for about 400 feet, being provided with double track, ¾ inch cable, and a drum at the head of the incline, worked by means of a friction clutch.

Timbering.—As the roof in both mines has been very sound, timbering has been a comparatively easy matter. The chief difficulties so far met with, have arisen from slight faults and one slight fall in No. 2. But even these have been secured by the use of a few extra props with ties as cap-pieces. The props and booms are of tamarack and spruce, procured from the neighboring forests. They range from 7 inches to 10 inches in diameter. The timbers are set in the usual way, it being rather more than usually important to set the head of the props a little above a perpendicular from the foot of the prop to the roof, owing to the tendency to creep. This causes the prop to tighten in case of a creep, thus offering resistance instead of falling out.

The method of timbering the gravel tunnels will be described later on.

Ventilation.—Considerable quantities of fire-damp, C H_4, are given off in both mines, due probably to the fact of the coal-beds being still almost intact and to their great thickness. Both mines show the natural tendency to become more fiery as the workings extend inwards from the exposed outcrops, and as, in consequence, the depth of covering increases. The problem of ventilation is, therefore, of increasing importance.

Moreover, the altitude, 3,800 feet, gives very low barometric readings of 24 to 25 inches, corresponding to a pressure of 12 to 12½ pounds per square inch. This low pressure greatly increases the amount of fire-damp's given off from the coal. It also increases the volume of air required to dilute the fire-damp and supply the men, in the ratio of 5.4. Besides, the reduced pressure augments the difficulty of exhaustion by fans. Thus, ventilation, as well as haulage and the tendency to creep, will require the closest attention of the engineer.

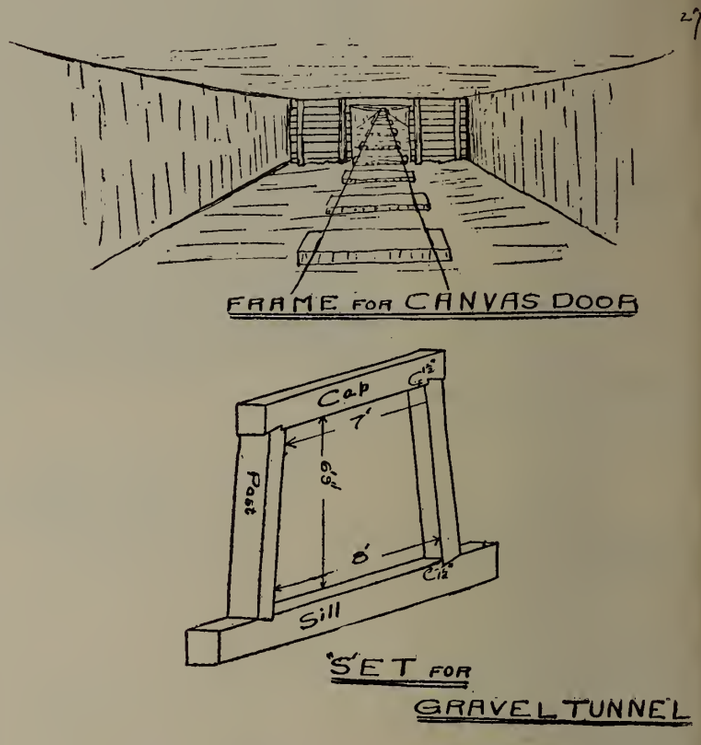
The splitting system of ventilation is the one adopted, there being at present 2 splits in each mine. The air-courses, splits, stoppings, etc., for No. 2 Mine are shown in the plan, the direction of the air-currents being shown by arrows. The ventilation of No. 1 is similar to that of No. 2.

It may perhaps be interesting to follow one of the splits around.

Referring to the plan of No. 2, we see that the air-current, 50,000 feet per minute, enters the mine by the main haulage road, 6 feet high and 8 feet wide, having a velocity therefore of a little over 1,000 feet per minute. At A, the current is split, one part turning to the right and the other to the left, as shown by the arrows. The air-current in both splits is directed round to the working places and kept from being dissipated through the old workings of the mine by means of the doors and stoppings indicated by the lines drawn from pillar to pillar. At B, is the first door, as the stopping here is across a haulage road. As a certain amount of leakage is necessary, in order to keep the haulage road from B down the main deep, supplied with air, this door is made of canvas. The use of a canvas curtain also saves the expense of a door-boy. Similar canvas doors replaces the tight-board stoppings wherever the latter would interfere with haulage.

Following the left split around, we come to a typical working place at E (See E on tracing of plan). Here the air would short-circuit and not sweep the gas from the working-face were it not for the canvas stretched from roof to pavement shown by the line a b. The brattice is extended as the working-face is pushed forward, always

Plate IV.



being kept within about 9 feet of the face. When the room is extended about 60 feet, to C, a cross-cut, c d, is made into the next working-place, a tight-board stopping is placed at E F, the brattice is removed, and the air is thus short-circuited through the cross-cut, c d. This is the method of directing the air-current to the face of all rooms and entries. Entries are driven in pairs with cross-cuts at intervals of about 60 feet, one entry acting as the intake, the other as the out-take.

Still following the left split we come to F, where the right split having traversed a similar course, unites with the left in the return drift. At G, is an over-shot, where the outgoing current is made to pass over the left in-coming split.

Passing onwards we come to the air-pit. Here a tight door is placed across the return-drift and the air passes up the air conduit, the fan above acting as an exhaust.

This fan is of 8 feet diameter by 4 feet width, with 14 vanes. It

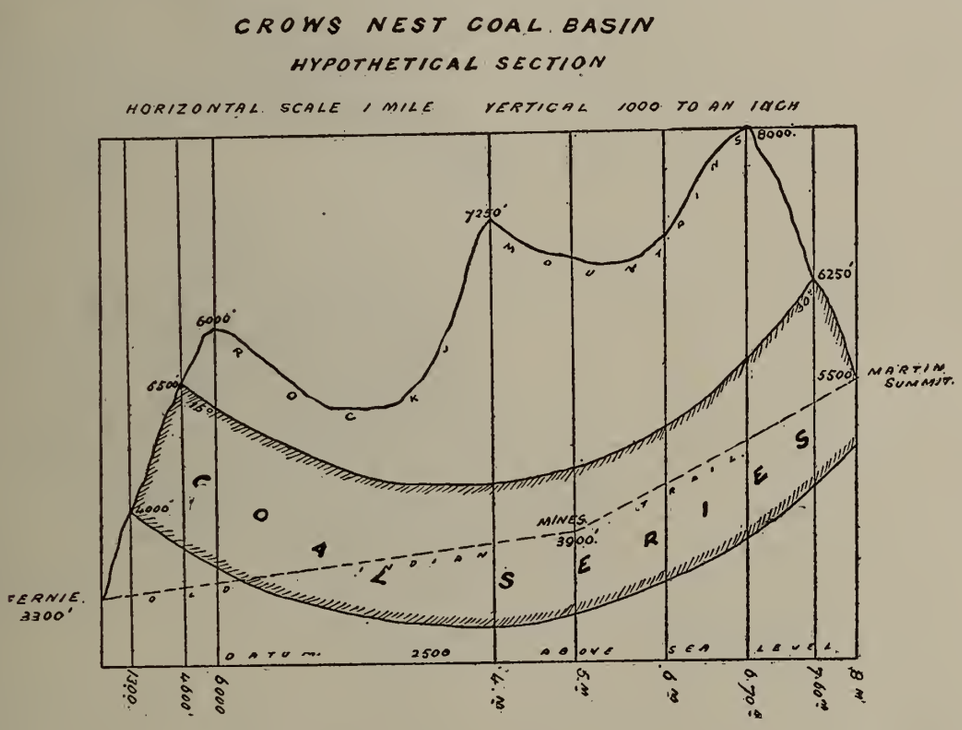
is belted to an Atlas horizontal engine, the ratio of the engine and fan speed being 5.8. The fan speed at present is 208 revolutions, supplying 50,000 feet of air to the mine per minute. It is capable of supplying 70,000 to 80,000 feet per minute as occasion arises.

The amount of air required by law is 100 cubic feet per man per minute. The amount in circulation in each of these mines as shown by calculation from the velocity indicated by the anemometer, is more than 300 feet per minute for every man, boy and horse.

LIGHT.—The trestle is lighted by 16 pairs of incandescent lamps of 16 candle power. The main haulage roads are lighted by 40 similar lamps of 20 c. p., one lamp being placed at each turn in the road and 3 at each landing. Arc lamps were tried at first, but these proved unsatisfactory as they burned out quick by owing to coal dust.

Naked lights are used in all parts of the mines except those reported unsafe by the fire-bosses. In July, 1900, 40 Clanny safeties were in use but the company keeps on hand a sufficient supply for use by all underground laborers in case of emergency.

DRAINAGE.—Considering the extent of area developed below the drainage level there is but little water. The irregular ground prevents concentration into one or more main sumps. To remove the water



met with in the lower rooms of No. 2 Mine, 2 Tripley electric pumps, 1 Sould hand pump and 1 water car are in use. The capacity of the electric pumps is about 20 gallons per minute, each of the 3 plungers working at 60 strokes per minute. Their position is shown in the plan. The small quantity of water met with in No. 1 is handled by 1 electric pump and 1 hand pump. Each of the electric pumps is driven by a 3 H. P. Motor.

SURFACE TREATMENT.—After being dumped by the Mitchell Tippler as above described the "run of mine" coal passes on to the screens. There are 2 mechanically driven shaker screens, 20 feet by 5 feet, with a working speed of 100 strokes per minute, the stroke being 6 inches. Their inclination is 17 degrees. The slack eliminated by the upper screen passes on to the under screen, which, as required, separates it into coking, and smithing or domestic coal. The screens are fitted with interchangeable, steel-wire bottoms of ¾ inch, and 1½ inch, mesh. The large coal is discharged by the upper screen upon a travelling picking-table from which the sorters remove any pieces of bone, slate or stone that may have escaped the notice of the diggers. The picking-table is 60 feet long, 5 feet wide, and travels 40 feet per minute. The discharge of coal is regulated by means of friction gear attached to the driving shaft. The large coal and slack are discharged direct into cars standing on the sidings below. These cars are run down by gravity for filling, and again for coupling into trainloads, the grade for that purpose being 2 per cent. All the slack goes to Fernie for manufacture into coke. The grade of the spur from Fernie to the mines is 2 per cent.—length of 5 miles.

POWER.—Two Polson's fire-tube boilers, locomotive style, of 100 H. P. each supply steam at 100 lbs. pressure to the following engines: Dynamo engine, No. 2 fan engine, machine-shop engine and engine for screens and creeper. Steam for No. 1 fan engine is supplied by a small separate boiler. Two new boilers are being introduced to meet the increasing demands for steam as the mines rapidly develop. One is a water-tube boiler of the Polson make, Heine type, 200 H. P.; the other is a return tube boiler, horizontal furnace, 80 H. P. made by the Jeffrey Manufacturing Co., at Columbus, O. The dynamo is driven by a Polsons horizontal engine. It is a direct-current, constant-potential dynamo of 134 H. P., over-compounded 10 per cent. It supplies a current of 400 amperes on the line at 220-250 volts. The current is conducted into the mines by a figure-8 copper wire (equal to 00 B. and S. gauge) suspended on standard mine hangers. The dynamo supplies electricity for: 3 electric pumps, 2 locomotives, the hoist in No. 2 Mine and the incandescent lights at the surface and in the mines. Details of the boilers, engines, etc. will be given under "Statistics."

The disposition of the surface plant will best be made clear by referring to Photo No. 1.

DEVELOPMENT.—Besides the usual driving of narrow-work, at which 40 miners are employed, a new tunnel is being driven to each of the mines. That to No. 1, is a rock and gravel tunnel of 1¼ per cent. grade and is to serve as a main haulage road. Owing to striking a bed of quick sand after the rock had been pierced, excavation from within has been abandoned and has been begun from without. The dotted line in the plan indicates the unexcavated part. The short trestle shown to the right of the old trestle (in Photo No. 1) is for this tunnel. The new trestle is provided with gravity return for the coal-boxes and with an Ottumwa box-car loader.

The new tunnel to No. 2 Mine, (really a slope since it follows the dip) is shown in the plan. The first 60 feet is in gravel, the grade being 12½ per cent. At this point the tunnel enters the coal, when the grade becomes variable, as the seam is undulating. At 90 feet the drainage tunnel (shown in the plan) was driven. Rooms are to be branched from this slope, along the strike. The timbers used in the gravel tunnel were hewn 10 to 12 inches square and framed in sets as shown in the sketch (See page 27). These sets were placed at right angles to the dip, 4 feet apart from centre to centre. To prevent filling in, the sides and top were tightly lagged, the top lagging being 3 inches thick. The lagging was strengthened, when the tunnel was completed, by placing lining sets midway between the sets above referred to. Owing to the steep grade, this slope will be operated by a separate engine and cable.

Office Work.—Following is a brief account of the staff at the mines with the duties of each: One superintendent, who has complete charge, under the General Manager, of the mines and coke ovens; one assistant superintendent, who has charge of the mines only; 3 overmen, one on each shift, who have control of the ordinary miners and shift-men, but not of those employed in development work, these being under the immediate charge of the superintendent; 1 time-keeper and 1 assistant, who have charge of the store-houses and magazines, issue the time checks, powder, oil, tools and other mine supplies, and keep all the books necessary to account for these; one clerk, whose duties are to keep the "coal-tonnage" book and the "yardage and considerations" book, and to make out the daily report, which, signed by the General Manager is at once forwarded to the Managing Director at Toronto.

At the General Office at Fernie, the General Manager, who, under the Managing Director, has control of the Michel, the Erickson and the Coal Creek Collieries, is assisted by: 1 book-keeper, 1 type-writer, 1 clerk, 1 coal-shipper and weigher, 1 coal agent and 1 surveyor and helper.

A complete survey of the working-places is made once every 3 months and added to the large progressive plan kept at the general office, a tracing of which is immediately forwarded to the Managing Director. Minor surveys are made at shorter intervals as needed.

Production.—About 50 per cent. of the total "whole coal" is at present left as pillars forming an enormous reserve for extraction when the upper seams shall have been exhausted. Of the coal extracted 40 to 45 per cent. is slack, which is entirely utilized for coke, the coke being of the best quality and in great demand.

The average daily output, July, 1900, was 700 tons, the total average cost of extraction and preparation per ton being $1.30. No doubt by this time, with the completion of the two new tunnels this output is more than doubled.

All the coal is of the class known as coking coal, lying between bituminous and anthracite in hardness and containing 80 to 90 per cent. of carbon.

Coke Ovens.—All the slack from the C. N. P. Co's. collieries is shipped to Fernie for manufacture into coke.

The coke-ovens are of bee-hive shape, 12 feet in diameter and 7 feet 3 inches high with open tops. When completed, there will be 500 of them, placed in two double rows, with 3 railway tracks one on each side and one between. The shape, construction, tracks, etc. are shown in Photos Nos. 4, 5 and 6.

The coking-coal is stored in the mammoth, double-decked, self-discharging bin shown in Photo No. 8. The bin has a capacity of 4,500 tons, cost $20,000, and required ¾ of a million feet of lumber in its construction.

The ovens are charged by the steam lorry (an electric lorry was used at first) shown in Photo No. 7, having a capacity of 7 tons of slack. The lorry-track, passing over the oven and under the bin, is of standard gauge, 4 feet 8½ inches.

The average charge of slack per oven is 6½ tons (2,000 lbs.); production of coke per charge, 4.42 tons; percentage of coke, 68; time of burning charge, 60 to 72 hours; average out-put per day, 1.4 tons.

No provision is made at present to recover any of the by-products.

The coke is cooled by watering inside the ovens. Coke thus cooled is said to be superior to that cooled outside the ovens, containing less moisture though the process deteriorates the inside lining of the oven and causes considerable loss of heat.

Market.—Both coal and coke have found a ready market and the demand for both is rapidly increasing. The distribution embraces the Territories east to Winnipeg, the Western States and British Columbia. Large quantities have been used by the C. P. Ry. and large consignments have been shipped to the Royal Navy at the Pacific Station. The coke finds a ready market at Trail, Butte, Anaconda and other smelter towns of the West.

Transportation.—As before stated, the colliery is situated 5 miles from the Crow's Nest Branch of the C. P. Ry., with which it is connected by a spur of 2 per cent. grade. By means of this railway there is direct communication east and west but there is the serious drawback of high freight rates, resulting from lack of competition. Large consignments of coke, for smelting purposes, are shipped to the Western States via the Lethbridge and Great Falls Narrow Gauge Railway, 200 miles in length, which necessitates transhipment from broad to narrow, and again from narrow to broad gauge before reaching its destination. Application has been made for a charter for a branch railway connecting Fernie with a spur to be built from Jennings on the Great Northern.

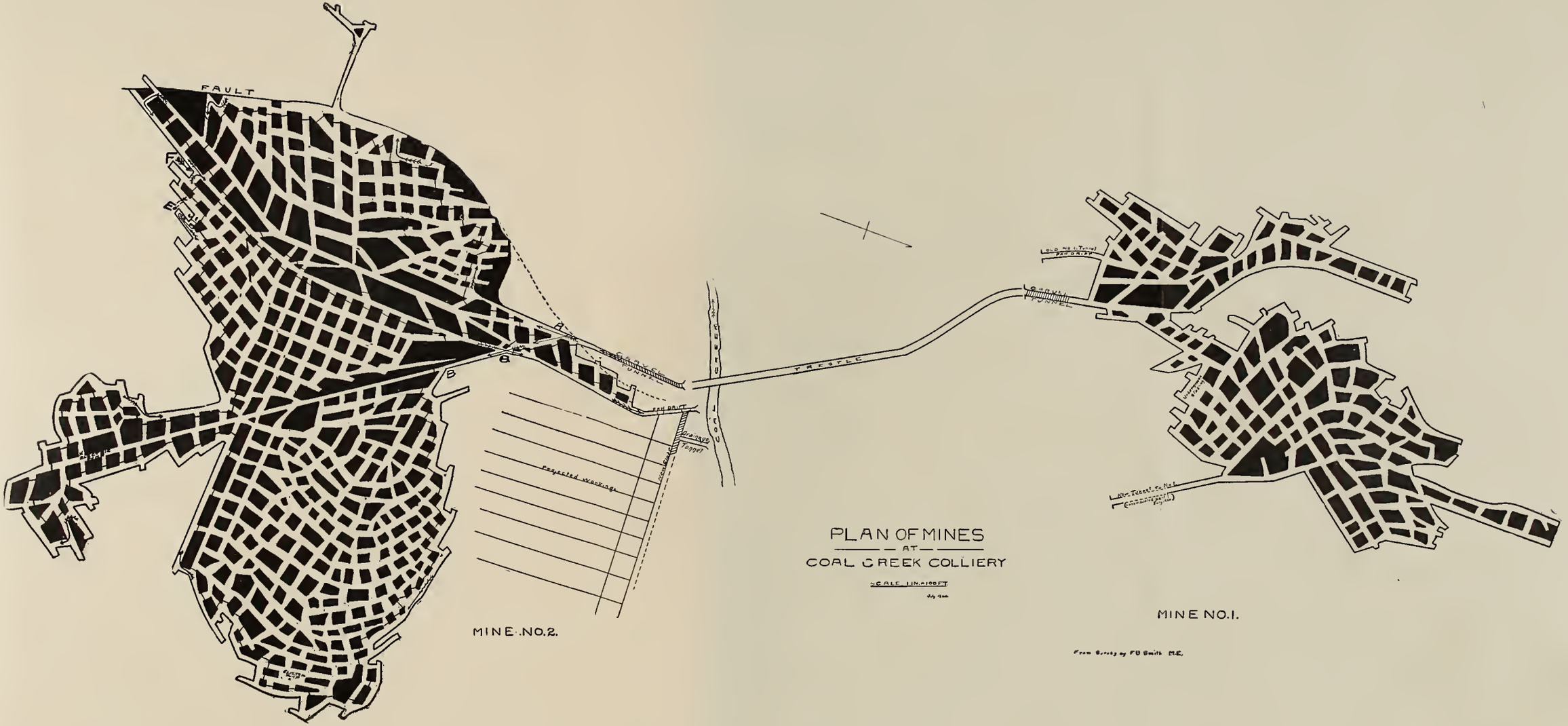
It is highly probable that Fernie will become a great smelting town as it has, in addition to coke, an unlimited supply of limestone in the mountains near at hand.

Thus are being opened up, the vast resources of one comparatively small part of the unlimited mineral wealth of our Dominion.

Statistics.—I. *The Motor:* (See Photo No. 3). Length, 10 feet 6 inches; height, 3 feet 4 inches; width, 4 feet 7 inches; wheel centres, 3 feet 4 inches; gauge, 3 feet; driving wheels, 2 feet diam.; weight, 10 tons; H. P., 70; possible load, 17 boxes of 3,000 lbs. each; average loads, 13 boxes; speed, 8 m./h.; made at Columbus, O., by the Jeffrey M'f'g. Co.

II. *The Coal Boxes:* Made by blacksmiths and carpenters when not employed on repairs. Following are details: Capacity. 1 ton or with top setting (or "pitchings"), 3,000 lbs.; tare, 1,100 lbs.; material of box, 1½ inches spruce; length, 5 feet; depth, 2 feet; width, 4 feet; length over trams, 6 feet 6 inches; frame, 2 lengthwise pieces, 4 inches x 6 inches, acting as bumpers, and 3 cross-pieces, 4 inches x 6 inches. *Mountings:*—Front strap, 2 inches x ⅝ inch; middle strap, 2½ inches x ¾ inch; inside angle-iron, 3 inches x 1¼ inches; hinges for end dumping doors, 2½ inches x ½ inch x 23½ inches; strap round 2 sides and one end of box at top, 2¼ inches x 1¼ inches; wheels, Hadfield's patent, cast-steel, 12 inches diameter, 7 spokes; axles, 1⅞ inches diameter; wheel centres, 1 foot 10 inches; gauges 3 feet; wheels rotate separately on axles; total height of car above rails, 3 feet 3 inches; couplings, 3 links of 1 inch round iron and 2 clevises of 1¼ inches iron. Spragging is used by the drivers instead of brakes.

III. *Tracks:* Gauge, 3 feet; ties of main haulage roads, 5 feet x 4 inches x 6 inches—2½ feet from centre to centre, firmly spiked and fish plated. Motor rails, 40 pounds to the yard; stall rails 25



PLAN OF MINES
AT
COAL CREEK COLLIERY

SCALE 1 IN. = 100 FT

From Survey by F B Smith M.E.

The new tunnel to No. 2 Mine, (really a slope since it follows the dip) is shown in the plan. The first 60 feet is in gravel, the grade being 12½ the grade b drainage t branched f gravel tun shown in tl angles to tl in, the side thick. Th by placing Owing to engine and

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The slack. The lorry-track, passing over the oven and under the standard gauge, 4 feet 8½ inches.

used at first) shown in Photo No. 7, having a capacity of 7 tons of and fish plated. Motor rails, 40 pounds to the yard; stall rails 25

pounds to the yard; switches and frogs, made at colliery shops from F. B. rails. No. of track layers, 2 on each shift in each mine, 12 in all. Tools used: 1 combined pick and claw, 1 spike hammer, 1 shovel, 1 bar, 1 track-gauge, 1 "Jim Crow",—(for bending rails)—for for each mine. Also one track-cleaner is employed.

IV. *Engines:* *(a) Dynamo Engine:* Horizontal engine of Polson make; cylinder, 16 inches diam.; stroke, 16 inches; speed 225 strokes per minute; I. H. P. 150; cut-off, automatic, cutting-off light at 1/16th stroke; loaded from 1/16 up.

(b) No. 1 Fan Engine: Nagle horizontal engine; cylinder, 14 inches diam.; stroke, 16 inches; speed, 62 strokes per minute; cut-off at 3/4 stroke; B. H. P., 40; steam supplied by a 45 H. P. loco-tubular boiler with working pressure of 50 pounds per square inch; engine slowed down once in 2 weeks to fill oil-cups of crank and cross head.

(c) No. 2 Fan Engine: Atlas horizontal engine; cylinder, 12 inches diam ; stroke 14 inches; cut off at 3/4 stroke; speed, 130 revo per minute; steam supplied by 2 inch piping, from power-house boilers 500 feet distant—being first dried in an upright receiver; pressure, 100 pounds per square inch; engine stopped about 3 minutes every 24 hours to fill oil-cups of crank and cross head.

(d) Engine for Surface Plant: Upright; cylinder, 10 inches diam.; stroke, 12 inches; cut-off at 3/4 stroke; I. H. P., 22; steam supplied by power-house boilers 100 feet distant—not dried before using.

(e) Machine shop Engine: Upright; cylinder, 6 1/2 inches diam.; stroke, 9 1/2 inches; cut-off at 3/4 stroke; speed, 130 revs. per minute; I. H. P., 10; steam supplied from power-house boilers.

V. *Boilers:* In use in summer of 1900—2 Polson's fire tube boilers, locomotive style, of 100 H. P. capacity each, supplying steam at 100 pounds pressure to the engines mentioned above; diam.; 4 feet 6 inches; length, 23 feet; diam. of tubes, 3 inches; consumption of coal, 4 to 5 tons each per 24 hours; draft for each, 24 inch stack, 70 feet high. Two additional boilers were being added, one of the Polson make, Heine type of 200 H. P. capacity; the other of 80 H. P. capacity and made by the Jeffrey M'f'g. Co.

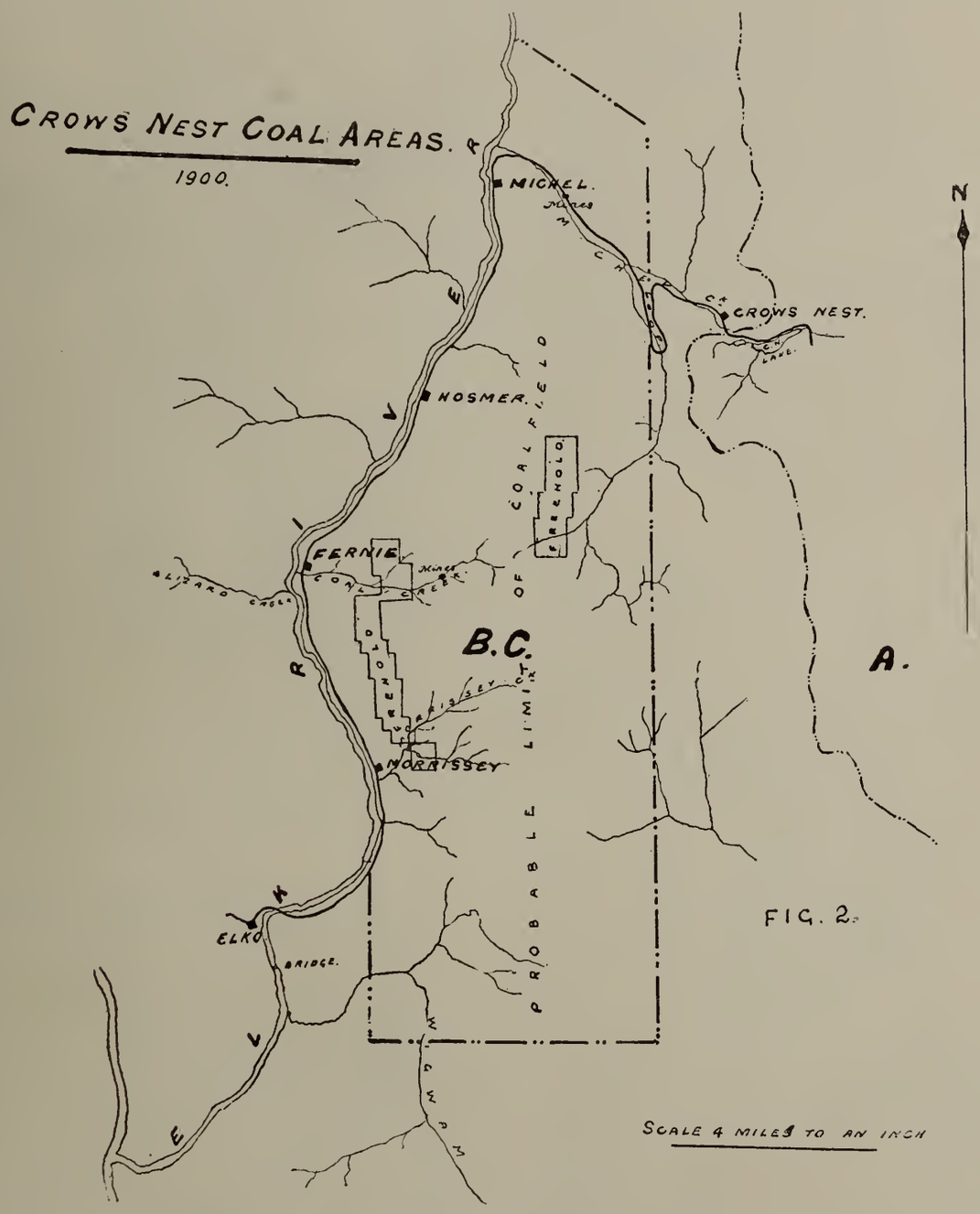
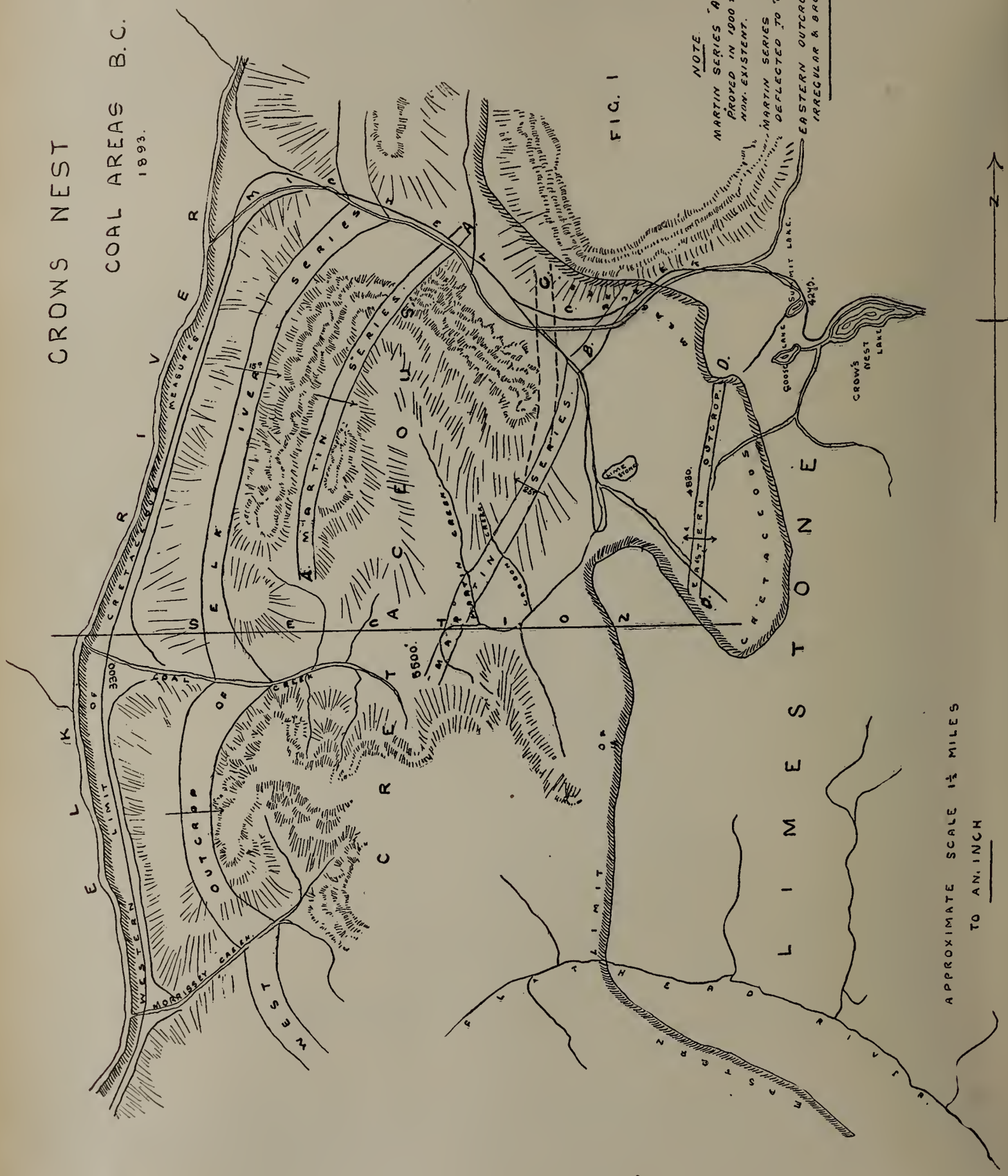


FIG. 2.


CROWS NEST
COAL AREAS B.C.
1893.
FIG. 1
NOTE
MARTIN SERIES "A-A" PROVED IN 1900 TO BE NOW EXISTENT.
MARTIN SERIES B DEFLECTED TO "C."
EASTERN OUTCROP D.D. IRREGULAR & BROKEN.
SELKIRK MOUNTAINS
CRETACEOUS
LIMESTONE
MARTIN SERIES
EASTERN OUTCROP
WESTERN OUTCROP
BOUNDARY LINE
SUMMIT LAKE
CROW'S NEST LAKE
GOOSE LANE
LOAD CREEK
MORRISSEY CREEK
APPROXIMATE SCALE 1½ MILES TO AN. INCH

VI *Costs etc:* Miners are charged for oil, powder, squibs and lost or broken tools, but not for tools and repairs.

Costs, last summer (1900) were as follows: Oil, 80c. to 90c, per gallon, powder, 15c. per pound, squibs, $1.00 per 100. Not more than 4 pounds of powder are allowed to a pair at one time.

The prices paid for work were as follows: Per ton, in rooms with nights, 60c. with closed lights, 80c. In narrow work the usual tonage is paid, also yardage, and $1 per set for timbers. In both wide and narrow work, "considerations" are allowed by the Superintendent for special difficulties—as for water, stone, slight faults or branching stalls. The allowance for branching a stall is $1.25; other "considerations" are settled as they arise.

VII. *Machine shop Fittings:* One Williams lathe; one drilling machine; two emeries; four jackscrews; three sets bolt dies; one set pipe dies; pipe vise; and the usual hand tools for keeping the engines and other mine machinery in repair. Three mechanics are employed besides three electricians, two engineers and one on repairs.

VIII. *Smithy:* Five blacksmiths are employed as follows: 1 steele-sharpener who sharpens all picks, augers, wedges and other tools used by the miners; 1 blacksmith and helper for new work; 1 blacksmith and helper for shoeing and repairing. All steel and iron used, together with the scrap, are meighed and charged to the job for which used; The number of hours spent on each job is also charged against that job.

IX. *Labor:* The average wages earned by the miners is $3 to $4 per day; general mine labor costs $2 to $2.75 per shift; general surface labor, $1.75 to $2; boys receive $1 to 1.75.

About 350 men were employed at the mines (July 1900), distributed as follows: (*a*) *Above Ground*, 2 weighmen, 2 tally boys, 6 bankmen, 6 slate pickers, 12 car loaders, 2 trimmers, (for trimming slack cars and box cars), 5 yardmen, 3 blacksmiths and 2 helpers, 2 carpenters and 1 framer, 3 mechanics, 3 on electric works, 2 firemen, 2 fan tenders, 2 engineers for screens, 3 prospectors, 8 on construction work 1 time keeper, 1 helper, 1 clerk. (*b*) *Underground*, (about 290 in all); 3 overmen, 5 fire.bosses, (2 shot-lighters and 3 bosses), 6 track-layers and 6 helpers, 2 driver bosses, 18 drivers, 4 motormen, 4 conductors, 2 on electric hoist in No. 2 mine, 6 landing tenders, (3 men and 3 boys), 10 pushers and incline men, 12 pumpmen, and bailers, 3 shiftmen, (sparemen on each shift for emergencies, e. g. of water), 4 timbermen, 12 on new rock tunnel work, 40 miners on yardage (narrow work), 120 ordinary miners in rooms. Length of shift under ground is 8 hours "from pits mouth to pits mouth."

The Composition of Some Canadian Limestones.

(A) For Calcium Carbide. (B) For Chemical Wood Pulp. (C) For Portland Cement.

By J. T. Donald, M.A., Montreal.

The rapid development of industries in which lime or limestone is a raw material has given a new interest to this common mineral.

The term limestone, however, as generally used includes any rock in which carbonate of lime is the predominant ingredient.

This of course gives a wide range of composition.

The ideal limestone is pure calcium carbonate containing 56 p.c. of lime and 44 p.c. of carbon dioxide.

The conditions under which beds of limestone have been deposited were such that it is scarcely possible to find them fully up to our ideal in degree of purity.

Being a sedimentary rock, we usually find limestone containing more or less siliceous matter, either as silica or as silicates.

The amount of siliceous matter may vary from a few tenths of one per cent. up to even forty or fifty per cent.; in which latter case it is a question whether we should consider we have a sandy limestone or a calcareous sandstone.

But again, in nature we usually find that carbonate of lime is associated with carbonate of magnesia; indeed, it is scarcely possible to find a limestone that does not contain an appreciable percentage of magnesia; whilst on the other hand the magnesia may occur in such percentage that the stone becomes a magnesian limestone or dolomite, which normally contains: Lime 30.40 p.c., Magnesia 21.70 p.c., Carbon dioxide 47.90 p.c.

In addition to silica or silicates and magnesia, all limestones contain more or less of what someone has aptly called the "intruder into everything on earth" viz., iron, in the form of iron oxide or iron sulphide.

The principal industries that call for limestone as one of their raw materials, are:

Calcium Carbide.
Chemical Wood Pulp.
Portland Cement.

The object of this brief paper is to state in a general way the characters of the limestone required in each of these industries, illustrating by reference to Canadian limestones that have been analysed by the writer.

(A) *Calcium Carbide.*

A limestone to be suitable for the manufacture of this article should be as nearly as possible pure calcium carbonate. The presence of magnesia is particularly detrimental. A small percentage of siliceous matter and a little iron oxide may be tolerated. These points are illustrated by the following analyses.

I.—Is being used in a Canadian carbide works.

II. and III.—Are unsuitable for carbide; II. because of the magnesia it contains; and III. on account of the high percentage of siliceous matter.

	I.	II.	III.
Insoluble	——	2.14	10.92
Carbonate of Lime	96.89	52.00	87.71
Carbonate of Magnesia	1.64	42.71	.30
Iron Oxide	——	2.20	.70

(B) *Chemical Wood Pulp.*

For soda pulp, *i.e.* pulp made by "cooking" the spruce or other wood in a solution of caustic soda, any ordinary good limestone will yield a lime suitable for causticising the soda.

But in the case of sulphite pulp it is otherwise; selected material is required. In this case the presence of magnesia is desirable, indeed the higher the percentage of magnesia, the more desirable is the stone. But iron is decidedly objectionable; its presence causes discoloration of the pulp. The following analyses are of Canadian limestones.

I. is an excellent stone for sulphite pulp. II. whilst good in other respects contains too much iron. III. does not contain sufficient megnesia.

	I.	II.	III.
Insoluble	2.10	2.14	.14
Carbonate of Lime	56.21	52.00	98.78
Carbonate of Magnesia	41.20	42.71	Traces.
Iron Oxide	.09	2.20	.19

(C) *Portland Cement.*

This article is made by calcining a mixture containing proper proportions of silica, lime and alumina; this is usually a mixture of limestone and clay. A somewhat wide range of material is admissible in this industry. Magnesia is debarred to the extent that the finished cement must contain less than 3 per cent. of magnesia.

A limestone comparatively high in silica is admissible here, provided a clay or shale rich in alumina is obtainable.

A certain kind of impure limestone is the sole raw material for certain kinds of Portland cement. This is commonly known as natural cement rock. It is really an argillaceous or shaley or clayey limestone; that is, it is the materials for Portland cement ready mixed by nature.

The following analyses illustrate the statements just made.

I. is an ordinary limestone suitable for cement. II. contains too much magnesia. III. is a natural cement rock.

	I.	II.	III.
Insoluble	1.51	20.23	24.74
Carbonate of Lime	97.21	50.37	41.80
Carbonate of Magnesia	1.15	24.63	8.60
Iron Oxide	.17	2.81	6.30

The Analysis of Corundum and of Corundum Rock.

By Dr. W. L. Goodwin, Kingston, Ont.

Since the discovery of corundum in Eastern Ontario the writer has been obliged to pay considerable attention to the analysis of the rock in which the corundum occurs, and particularly to the determination of the percentage of corundum, of iron, and of silica. Each of these determinations presents difficulties of its own.

Determination of Corundum.—The percentage of corundum can be arrived at in three different ways, two of which are fairly accurate, viz: (1) The hydrofluoric acid method, and (2) The specific gravity method; while the third is only approximate, viz: (3) separation by heavy solution. These methods have all been used in the laboratories of the School of Mining, and (1) and (2) have been shown to give concordant results. Details of the separation by hydrofluoric acid may be of service.

The Hydrofluoric Acid Method.—Hydrofluoric acid attacks corundum very slowly at temperatures up to 100° C, but more rapidly at higher temperatures. On the other hand it quickly disintegrates the minerals which accompany corundum. The effect of temperature is shown by the following results, which were obtained by treating the ground sample in a platinum crucible heated by a small Bunsen flame. The sample was moistened with sulphuric acid, covered with sufficient hydrofluoric acid, and evaporated until fumes of sulphuric acid appeared. The soluble matter was washed out and the insoluble corundum ignited and weighed. The samples were all alike. The percentages of undissolved corundum were 83.58, 89.02, 81.63, 80.06, 69.75, 77.48, and 74.77. The variation is very marked. This sample contains 93 68 per cent. of corundum, as shown when the evaporation is carried on on a steam bath, followed by heating with a Bunsen burner until fumes of sulphuric acid just appear. For this determination it is not necessary to grind the sample very fine. Crushing in a 'diamond' mortar is sufficient. Two samples of another lot gave 95.64 per cent. and 95.38 per cent. To test the insoluble residue from another specimen, it was fused with Na H S O_4, and from the dissolved melt, the alumina, etc. were precipitated by ammonia, with the following results:—

Insoluble in H F and H_2 S O_4 ..... 92.16 per cent.
Alumina, etc. in this insoluble part .. 92.16 "

To test the applicability of the method to corundum rock a mixture was made of 20 per cent. of pure corundum and 80 per cent. of tailings containing at most a trace of corundum. This yielded on analysis 20.32 per cent. insoluble in H F and H_2 S O_4. Three samples from 500 lbs. of corundum rock gave

	Insoluble in H F and H_2 S O_4.
I.	21.01 per cent.
II.	20.51 "
III.	19.28 "

Sample I. was treated without previous ignition. Sample II. was ignited, and sample III. was ignited for a longer time than II. Ignited corundum was shown by other experiments to be attacked to a greater extent than when not ignited. This is perhaps due to the disintegration of the granules by the escape of the combined water, which amounts in a 93 per cent. sample to about 1.5 per cent.

Determination of Corundum by Specific Gravity.—This method is applicable to the concentrates freed from magnetite. The approximation to the results of the chemical method is very close, as shown by numerous experiments. For example, the specimen which by chemical analysis showed 93 68 per cent. of corundum, gave 93.71 per cent. by specific gravity. The calculation is made on the basis of a specific gravity of 4 for the corundum and of 2.7 for the impurities (mostly feldspar).

Determination by Separation with Heavy Solution.—By this method the results are only approximate, as the corundum carries down adherent feldspar and mica, thus giving too high a percentage of corundum.

For the sample already mentioned the following are the comparative results by the three methods:

I. By chemical analysis 93.68
II. By specific gravity 93.71
III. By heavy solution 95.23

Determination of Iron and Silica.—The principal difficulty here is to grind the sample finely enough without picking up iron from the mortar. Experience has showed that a considerable percentage of iron is added by crushing in a 'diamond' mortar. Attempts were made to estimate this and to apply a correction, by estimating the iron soluble in acetic acid, and calculating this as metallic iron derived from the mortar. The following results were obtained:—

	Fe dissolved by Acetic Acid.
Sample I.	0.57 per cent.
" II.	0.32 "
" III.	0.20 "

This method was abandoned in favour of crushing and grinding a weighed quantity of the grains a little at a time in a large agate mortar closely covered with paper, and finding the gain in weight. In this sample both iron and silica can be estimated, as the gain in weight can be taken as silica. To illustrate the magnitude of this correction the following will suffice:—

	Weight of Sample.	*Gain from Mortar.*	*Percentage Gain.*
1.	0.4702	0.0039	0.83
2.	1.0000	0.0122	1.22
3.	1.0000	0.0073	0.73
4.	1.0000	0.0029	0.29
5.	1.0000	0.0034	0.34
6.	1.0000	0.0084	0.84
7.	1.0000	0.0211	2.11
8.	1.0000	0.0106	1.06
9.	1.0000	0.0209	2 09

Nos. 1, 2, 3, 6 and 8 are high grade corundum grains.

Nos. 4 and 5 are corundum rock containing about 20 per cent. of corundum.

Nos. 7 and 9 are pure corundum.

The difference in the abrading effect on the mortar is marked.

The sample is fused with Na H S O_4, as recommended by Lawrence Smith, and dissolved. The iron is estimated by titration in the soluble portion. The insoluble portion is ignited and weighed as Si O_2. As a check, the silica may be volatilised by H F and the residue, if any subtracted.

Corundum is now being produced at Combermere by the Canada Corundum Co. of a very high grade, viz. 95 p.c. corundum. When it is remembered that manufacturers have heretofore been satisfied with an 80 per cent. product, the outlook for the Canadian industry seems very bright.

CANADIAN MINING INSTITUTE.

Annual Meetings Largely Attended.—Valuable Papers—Interesting Discussions.

The annual General Meetings of the members of the Canadian Mining Institute were held as usual in the Club Room, Windsor Hotel, Montreal, on Wednesday, Thursday, and Friday, 6th, 7th, and 8th March. There was a large attendance of members, including quite a number of mining students from McGill University, Montreal, and Queen's University, Kingston.

WEDNESDAY SESSION.

The sessions opened on Wednesday afternoon at three o'clock. Mr. John Hardman, S.B., M.E., Montreal, being called to the chair, in the unavoidable absence of Mr. S. S. Fowler, the President.

The minutes having been held as read:—

NEW MEMBERS.

The Secretary submitted the following names, having received the approval of Council, for election :—

Mr. W. F. ROBERTSON, Mining Engineer,
Provincial Mineralogist for B.C., Victoria, B.C.

Mr. FRANK B. SMITH, Mining Engineer,
Fernie, B.C.

Mr. JOHN NORTHEY, Mechanical Engineer,
Toronto, Ont.

Mr. C. D. MAZE, Civil Engineer,
Montreal, Que.

Capt. BRUCE CARRUTHERS,
Kingston, Ont.

Mr. CHARLES H MACNUTT, Mining Engineer,
Pulacayo, Bolivia, South America.

Mr. F. N. SPELLER, B. A. Sc.
Bureau of Mines, Toronto, Ont.

Mr. HARRY WILSON, Mining Engineer,
Montreal, Que.

Mr. HARRY W. WELLER, Mechanical Engineer,
Montreal, Que.

Mr. D. E. K. STEWART,
Madoc, Ont.

Mr. FRED M. WELLS,
Republic, Washington.

Mr. H. C. FARNUM, Gen. Mgr. Copper King Mining Co.,
Eldorado, Ont.

Mr. ROBERT R. CARR-HARRIS, Civil Engineer,
Kingston, Ont.

Mr. SMITH CURTIS,
Rossland, B.C.

Mr. JOHN DEAN,
Rat Portage, Ont.

Mr. C. A. CHESTERTON,
Rat Portage, Ont.

Mr. H. C. MICHELL,
London, England.

Mr. J. E. ALDRED,
Montreal, Que.

These, together with about twenty others approved by Council, were duly declared elected members, subject to the provisions of the Constitution and By-laws.

SECRETARY'S REPORT.

Mr. B. T. A. BELL, Secretary, then reviewed the operations of the Institute during the year. The membership had grown from 192 in 1898, when the Institute was formed, to 323 in 1900, including 14 student members. In Canada, the membership by Provinces was : Nova Scotia, 19; New Brunswick, 2 ; Quebec, 77 ; Ontario, 91 ; British Columbia, 71 ; North-west Territories, 5 ; Newfoundland, 2. Six members had been removed by death, viz. :—Mr. James King, Quebec ; Dr. George M. Dawson, Ottawa ; Dr. Carl Hoepfner, Hamilton ; Mr. Ernest Bielenberg, Greenwood ; Mr. Barclay Stephens and Mr. James Foley, Montreal. Four members were absent in South Africa, serving with the colors. A reference was made to the work done by the Institute towards securing better mining legislation and in extending the library and reading-room of the Institute, and to the elaborate series of excursions carried out during September, when the Institute had as its guests the members of the American Institute of Mining Engineers. The Report, on motion of Mr. W. Blakemore, was unanimously adopted.

TREASURER'S REPORT.

Mr. J. STEVENSON BROWN submitted his audited financial statement, showing the receipts for the year to have been $4,055.37, and disbursements $3,424.76, leaving a cash balance forward of $630.61. The disbursements included :—Publications, $778.76 ; Library, $561.75 ; Meetings, $335.07 ; Legislation, $271 25 ; Secretary's Office, $674.60 ; Treasurer's Office, $316.09; General Disbursements, $487.24.

The Report was unanimously adopted.

DEATH OF DR. DAWSON.

Mr. B. T. A BELL said that every member of the Institute and every mining man in Canada deplored the untimely death of Dr. Dawson, the honoured head of the Geological Survey, and their late Vice-President. As Dr. Ami would present a memoir of the late Director at a later stage of the proceedings he only desired to intimate that the Council had decided to appropriate the sum of one hundred dollars and open a subscription among the members for the purpose of presenting to the Museum of the Survey a memorial portrait of the late Dr. Dawson, and also one of his predecessor, Dr. Selwyn.

Mr. WM. BLAKEMORE, seconded by Mr. P. KIRKGAARD, moved the following resolution :—"That the Canadian Mining Institute, in annual session assembled, desires to place on record its sense of the deep loss sustained by the Dominion of Canada, and especially by the mining profession of this country, in the lamentable death of Dr. George M. Dawson, late Director of the Geological Survey of Canada. It recognises the immense value of the services which he rendered in the important position which he occupied with such distinguished ability, and not least, the high qualities of mind and personal character which he displayed. The Institute wishes further to express its sympathy with his surviving relatives in their irreparable loss, and herewith forwards a copy of this resolution to them."

The motion was unanimously adopted.

SURVEY STAFF INADEQUATELY PAID.

Mr. B. T. A. BELL :—The matter of an appointment to fill the responsible position vacated by the death of Dr. Dawson seemed appropriate to direct attention again to the absolutely inadequate character of the remuneration given to the officers of the Geological Survey. It was little wonder that every year saw the ranks of this important branch of the public service depleted of some of its most valued officials. Only lately Mr. A. P. Low had been secured at a large salary by a Philadelphia Syndicate. Mr. W. A. Carlyle was managing the Rio Tiuto Mines, in Spain, at a salary of $25,000 per annum. Mr Coste, Mr. J. B. Tyrrell, Dr. Lawson, and Dr. Adams, were other examples of members of the Geological Survey who had greatly bettered themselves by leaving the Survey. While, of course, it was not to be expected that the Government could compete with private corporations in the matter of salaries, everyone would admit that the remuneration provided by the Government for the gentlemen occupying positions on the Survey was altogether too small for technical officers. Some representation might well be made to the Government on behalf of the Survey, not only on account of the inferior salaries paid its officers, but also regarding the wholly inadequate and dangerous character of the building provided for its valuable museum and offices. It was time more suitable premises were provided for the Survey's invaluable collections. He was in favor of sending a deputation from the Institute to press these matters on the Government. (Applause)

Dr. W. L. GOODWIN (Kingston) endorsed the remarks of the Secretary. Every member of the Institute agreed that the mining men would have to educate the legislators to the importance of the work done by the Survey for the development of the mineral resources of the country. He believed a committee should be appointed to draw up strong resolutions to be presented to the Government on the subject.

Mr. E. D. INGALL, of the Geological Survey, remarked that there was one point that had not been touched upon. The museum which the Institute and all mining men advocated would be a national museum, and the Geological museum would be a portion thereof. At the present time they had many valuable specimens which might be very instructive to those interested in mining, but they had to keep these specimens in boxes, as there was no room to display them. He thought it highly important to secure a safe display for the exhibits. The men in charge could be replaced if the building tumbled about their heads, but the exhibits could not be duplicated.

Dr. FRANK D. ADAMS, of McGill, considered the subject one of national importance. While the Government could not be expected to pay the salaries that are offered by some of the mining companies, the salaries should be such as would be an inducement to good men to remain with the Survey, which had done and was still doing such excellent work for the development of the country.

Professor CARR-HARRIS advocated the appointment of a delegation to draw up resolutions and present them to the Government.

The Chairman appointed the following delegation :—Prof. Carr-Harris (chairman), Kingston ; Dr. Adams, Montreal ; Charles Fergie, Westville, N.S ; W. Blakemore, Montreal ; B. T. A. Bell, Ottawa ; A. J. Moxham, Sydney ; H. M. Whitney, Boston ; F. H. Clergue, Sault Ste Marie ; Bernard MacDonald, Rossland ; S. S. Fowler, Nelson, B.C. ; and J. M. Clark, K. C., Toronto.

SCRUTINEERS APPOINTED.

On motion, Messrs. P. Kirkegaard, Charles Brent, and Wm. Blakemore were appointed scrutineers to examine the ballots for the election of officers.

NEXT PLACE OF MEETING.

It was decided to report to the Council the desirability of holding the summer meeting of the Institute in Eastern Ontario, making Belleville headquarters.

CIVIL ENGINEERS' BILL.

PROFESSOR CARR-HARRIS (Kingston) then brought up a matter which he believed was of great interest to every man present and to all mining men. The Canadian Society of Civil Engineers had made an effort to establish themselves as a close corporation. These efforts had been unsuccessful several times in Ontario and in the Dominion Parliament. They had also failed on one or twice in Quebec but finally had succeeded in getting their act of incorporation through the Legislature of this Province. He himself had joined the Society years ago on the understanding that it was not to be a close corporation but when they tried to obtain legislation to that effect he had left them. He represented that some of the claims laid before the legislators were unfounded and produced letters to show that the Institute of Civil Engineers of England and the Association of Civil Engineers of the United States were not protected by law as close corporations. He invited engineers to join the Dominion Institute of Federated Engineers, which included such men as Sir Sanford Fleming and welcomed members whether they had gone through the course prescribed by the rival association or not. Professor Carr-Harris concluded by cautioning members of the Institute against entertaining any half way measures or compromises regarding the Bill.

The Session adjourned at 5:30 p m.

EVENING SESSION.

The Members reassembled in the Club Room at eight o'clock, Mr. Hardman presiding.

The following papers were presented:—

"Across the Pitch vs. Up the Pitch." By O. E. S. Whiteside, M. E., Anthracite, N. W. T.

"Notes on Gold Milling Practice at the Athabasca Mine, Nelson, B. C." By E. Nelson Fell, A. R. S. M., Nelson B. C.

"Leaching Copper Ores by Sulphurous Acid." By E. P. Jennings, M. E., Salt Lake City, Utah.

"Shipping Coal by the Aerial Wire Rope System at Port Morien." By J. G. S. Hudson, M. E., Port Morien, C. B.

"A Simple and Convenient Instrument for Mine Surveys." By Frank Robbins, M. E., Kimberley, B. C.

"Rope Driven vs. Direct Driven Colliery Fans." By Francis T. Peacock, Montreal.

"Pioneer Work on The Crow's Nest Coal Areas." By Wm. Blakemore, M. E, Montreal.

"On the Iron Ore Deposits of Bilbao, North Spain." By Dr. Frank D. Adams, Montreal.

INSTITUTE RECOMMENDS DR. ADAMS AS SUCCESSOR TO DR. GEORGE M. DAWSON.

On the conclusion of Dr. Adams interesting and valuable paper which was beautifully illustrated by lantern projections, the Secretary stated that his attention had been called to an item in the evening paper announcing that the appointment of a successor to the late Dr. Dawson, Director of the Geological Survey had not been made. In this connection he desired to say that at a meeting of the Council held on the previous evening the Council had unanimously agreed to recommend to the Government the appointment of Dr. Frank D Adams. Dr Adams was eminently qualified to fill this important and responsible position. (Applause.) He would therefore on behalf of the Council submit their recommendation for the endorsement of the meeting

Mr James F. Lewis (Sherbrooke) said he had very great pleasure in moving that the recommendation of the Council nominating Dr. Adams be approved.

The motion having been agreed to unanimously the Secretary was instructed to forward the following telegram to the Hon. Clifford Sifton, Minister of the interior:—

> "Canadian Mining Institute at a large and representative meeting tonight unanimously recommends the appointment of Dr. Frank D. Adams an old member of the Survey staff and Logan professor of geology at McGill, as successor to the late Dr. G. M. Dawson"

INVITATION TO VISIT THE MINING LABORATORY AT McGILL.

Dr. Porter at McGill extended to the visiting members the usual invitation to visit the mining laboratories of McGill University which they would find most interesting.

MEDAL FOR STUDENTS.

The Secretary intimated that the Council had decided to appropriate Friday morning for a Student's Session and that their President elect, Mr. Charles Fergie, had agreed to donate a gold medal for the best Student's paper contributed to the proceedings of that session.

The meeting adjourned at 10: 0 p. m.

THURSDAY AFTERNOON.

The members met at three o'clock, Mr. Hardman in the chair. The following papers were presented:—

"Notes on the Magnetic Iron Sands of the North Shore of the St. Lawrence." By Mr. J. Obalski, Inspector of Mines. Quebec.

"On the Occurrence of Nickel in Oregon." By Dr. A. R. Ledoux, New York.

"On the Treatment of Arriferous Mspickel Ores" (Two papers). (*a*) By Mr. P. Kirkgaard, Deloro, Ont. (*b*) By Mr. Sydney B. Wright, Deloro, Ont

After discussion on these papers Dr. Henry M Ami presented a comprehensive sketch of the life and work of Dr. George M. Dawson.

The meeting adjourned at 5 45 p m.

THURSDAY EVENING.

Mr. Hardman took the chair at 8.15 p.m.

AUDITORS APPOINTED.

On motion, Messrs. H. W. DeCourtenay and George Macdougall were reappointed auditors for the ensuing year.

Dr. GOODWIN then presented his paper "On the Analysis of Corundum and Corundum Rock."

NOTICE OF MOTION.

Mr. J. STEVENSON BROWN, Treasurer, gave notice that at the next Annual Meeting of the Institute he would move that all rebates on Provincial Societies' subscriptions be abolished.

MINING PROGRESS IN 1900.

Mr. B. T. A. BELL, Secretary, then presented the balance of his annual report in which he reviewed in considerable detail some of the more salient features of mining enterprise throughout the Dominion in 1900 A conservative estimate he said, would place the value of the mineral production at not less than $67,000,000 as compared with $47,275,512 in 1899. Roughly speaking the production might be distributed as follows:—

Yukon, N. W. Territories and Manitoba.....	$28,000,000
British Columbia.....	16,000,000
Ontario.....	9,288,424
Quebec.....	3,000,000
Maritime Provinces.....	11,000,000

Returns from British Columbia while not complete gave a very fair idea of the progress made in that Province. So far they indicated: Tonnage ore mined 90 per cent. increase; Gold production 20 per cent. increase; Silver 35 per cent. increase; Copper 20 per cent. increase; Lead 200 per cent. increase, and increase in the value of lode mines of from 50 p. c. to 60 per cent. The Vancouver Island Collieries are expected to have at least held their own, while the output from the Crow's Nest Pass had risen from about 69,000 tons in 1899 to over 230,000 in 1900 and this increase of 161,000 tons will about represent the increase in the total production. From the Yukon the gold output had increased from about $17,500,000 in 1899 to over $25,000,000 in 1900. Returns from the Assay office, Seattle, showed dust and bullion from the Yukon received during the year $16,946 437.08; and purchased by the U. S. Mint and Selby Smelting Co., San Francisco, during eleven months, 1st Jan. to Nov. 30th. $5,395 000; to which would be added dust taken out but not reported, dust used in the country as a medium of exchange, at least another $3,000,000. Several thousand tons of coal were mined in the territory, and 531 tons exported to United States Territory. Dredging for gold on the Saskatchewan was still in an experimental stage, but this industry had a promising future. The coal output in the North-west Territories was—Bituminous coal 304,000 tons: anthracite coal, 17,500 tons. In Assiniboia the production of lignite at Roche Percee and Coal Fields will show an increase over previous years. In Manitoba prospecting for gold was being carried on in the district lying adjacent to the Western boundary of the Province of Ontario. The gypsum deposits lying north of St. Martin were also being opened up. The total value of the mineral output of Ontario for 1900 was $9.288.424, as compared with $8,789,901 in 1899. 11,109 persons were employed, and the wages paid amounted to $3,364,400. The prominent features were the great expansion in the production of copper, nickel, and iron. In Quebec the notable feature was the flourishing condition of the asbestos industry, the shipments for the year being the greatest and most valuable in the history of the industry, being:—From Thetford mines 31,254,700 lbs., from Black Lake 6,896,565 lbs., and from East Broughton 1,789,000 lbs. Including all districts the shipments of asbestos amounted to 23,251 tons and nearly 7,000 tons of asbestic, the whole of a value at the mine of not less than $1,000,000 The iron, pyrites, mica, graphite, gold, and other industries were touched upon.

Entering, as they unquestionably are, upon an era of immense activity, the coal iron, and steel industries of Nova Scotia occupied a foremost position in the mineral expansion of the year. The output of coal was the largest in the history of this industry. New collieries were being opened up at Port Morien, at Port Hood, Broad Cove and other parts of the Province. Mr. Bell then dealt with the iron, gold, gypsum, and other mineral industries, concluding a comprehensive review with statistics showing the pig iron, steel and lead bounties paid, and the quantities and values of mining and smelting machinery imported free and dutiable during the year.

Mr. E. D INGALL, Chief of Division of Mineral Statistics confirmed the estimates of production given by Mr. Bell, and pointed out that one interesting feature he had omitted was the fact that phosphate is being shipped from Tennessee right to Buckingham, which used to be the centre of our phosphate industry.

MR. W. BLAKEMORE—I should like to say a few words on the extremely interesting and valuable report presented by our Secretary The only difficulty is to grasp so much material as he has laid before us. Whatever else may have happened, it is evident we are face to face with a very large and satisfactory increase in the mineral production of Canada. An increase of 35 per cent is certainly very large. An interesting feature is that some of these developments are even more significant than the value indicates. For instance, the very large increase in the output of coal is significant, for all our industries or nearly all are dependent upon coal, and the large increase indicates the busy state which prevails in our other industries. We are all aware of the gigantic steel plant that is being developed and which was wanted to promote the consumption of our ore in Canada. There is no doubt that within a few years this will call for an increase in the production of coal that we perhaps do not now even estimate and a consequent large increase in population and prosperity. Recently I have been more interested in the west than in the east You know the effect there upon the smelting industry of a suitable and cheap coke. There is a larger market over the border than in Canadian territory—a legitimate and natural market for Can-

adian coke and it must go there, because there is no suitable coke produced over the border. As to the difficulty of transportation, that can be overcome by standardizing the narrow guage railway that runs from Lethbridge, and it would enable British Columbia coke to be laid down at Butte, Condor, and Helena at from $2 to $3 per ton cheaper than American coal. I have no doubt that that enterprise in the West will be the source from which all supplies of coke will be drawn for the West for use in both Canadian and United States territory, for smelting purposes. There is another question—that of sending coal from the East further into Canada. All the coal consumed in the centre of Canada comes from the States; but there are indications that it may be possible to send Nova Scotia coal as far west as Winnipeg. With a good waterway from Montreal to the Lakes, which I believe you will have before very long, and with the splendid iron ore from the shores of Lake Superior which is necessary to mix with the Nova Scotia ore to produce perfectly satisfactory results in Cape Breton steel-making, there will be a return cargo for boats which can take coal up to the lakes, and this will make it possible to lay coal down in Winnipeg for less than $7 a ton. I will leave other gentlemen to speak of the lead and silver; but as to the coal, iron, and steel industries, I can see that some of the anticipations in which I ventured to indulge when I came to this country, eight years ago, are being realized As mining men we wish every success to the great enterprises which are being established in our midst, and which have very reasonable probability of success.

Mr. CHARLES FERGIE moved a vote of thanks to Mr. Bell for his excellent paper.

Dr GOODWIN—I listened with much pleasure to the secretary's most exhaustive report. There is one part of it I should like to remark on, as being more particularly interested in the mineral development of Ontario, and that is the production of mica I didn't gather that Mr. Bell gave any figures of the output of this mineral

Mr. BELL—Yes; I quoted Mr. Gibson's figures of the production in Ontario. The bulk of the mica produced in Canada comes from Ottawa County, in Quebec, but it is difficult to approximate the value of the output. The figures published by the Government are not to be relied upon, being very much under estimated

Dr. GOODWIN—I understood Mr. Bell to say that the mica producers had formed an organization of some sort?

Mr. BELL Yes, they have formed the Canadian Mica Miners' Association, an organization of which I happen to be the Secretary. We are collecting and have a mass of useful data concerning the consumption of mica which for commercial reasons we desire to keep to ourselves. There is some talk of the producers forming a trust or combine with a view to regulating prices, and extending the market for Canadian mica, but I am doubtful whether this will ever be accomplished.

Mr. A B CLABON (Rossland) gave some interesting particulars of the progress of mining in British Columbia, the outlook for which, he said, was never more promising.

The vote of thanks to Mr. Bell having been carried unanimously the meeting adjourned at eleven o'clock.

FRIDAY MORNING.

Friday morning was devoted to a student's session, when valuable papers were contributed by Dr. J. Bonsall Porter and a number of the mining students at McGill.

FRIDAY AFTERNOON.

Mr P. KIRKGAARD, on behalf of the scrutineers, reported that the following had been unanimously elected, the officers and Council for the ensuing year being :—

PRESIDENT.

Mr. Charles Fergie, Mining Engineer, Westville, N.S.

VICE-PRESIDENTS.

Mr. R. R. Hedley, Metallurgist, Nelson, B.C.
Mr. Graham Fraser, Ironmaster, New Glasgow, N.S.
Dr. Frank D. Adams, Geologist, Montreal.
Mr Jas. McArthur, Metallurgist, Sudbury, Ont.

SECRETARY.

Mr. B. T. A. Bell, Editor *Canadian Mining Review*, Ottawa.

TREASURER.

Mr. J. Stevenson Brown, Montreal.

COUNCIL.

For British Columbia—

Mr. J. B. Hobson, M.E., Quesnelle B.C.
Mr. W. F Little, Colliery Manager, Anthracite, N.W.T.
Mr. E B. Kirby, M E., Rossland.
Mr. Bernard MacDonald, M.E., Rossland.

For Ontario—

Prof. Courtenay DeKalb, M E., Kingston.
Mr. P. Kirkegaard, Mine Manager, Deloro, Ont.
Mr Major R. G Leckie, Sudbury, Ont.
Mr. R. G McConnell, Ottawa.

For Quebec—

Mr. George R Smith, M L.A., Mine Manager, Thetford Mines, Que.
Mr. James T McCall, Iron Merchant, Montreal, Que.
Mr. Jas F Lewis, Sherbrooke, Que.
Mr. J. Burley Smith, M.E., Montreal.

For Nova Scotia—

Mr. R. E. Chambers, M.E., Bell Island, Newfoundland.
Mr D W. Robb, Mechanical Engineer, Amherst, N.S.
Mr. Henry S. Poole, M.A, A R.S.M., M.E., Halifax.
Mr. G. F. McNaughton, Mine Manager, Forest Hill, N.S.

Mr. HARDMAN, vacating the chair, called upon Mr. Fergie, the President elect, to preside over the meeting, and in introducing him to the meeting referred to his distinguished career in Canada as a mining engineer.

Mr FERGIE, who was received with much applause, then took the chair He thanked them for the great honour they had done him in electing him as their President, and he promised that during his term of office the work of the Institute and its interests would receive his earnest attention. He called for the co-operation of all the members, particularly in the matter of contributions to their Transactions. He invited members to present their experiences in mining practice. What was wanted was an interchange of ideas and experiences in practical mining work presented in a form most likely to bring about discussion.

Mr. J. M. CLARK, Q.C., LL.B., then presented a valuable paper on "Company Law."

Mr. J LOWLES (of London, Eng.) on being called upon said—It is quite a surprise to me to be called upon, for I cannot claim to be a mining engineer, although very nearly one. I was interested in hearing Mr. Clark make his remarks about the English Company Law, as I was in the House of Commons during the whole time the Bill was before it, and I heard the debates thereon. In one respect I think English company law has been far ahead of company law on this side because no such thing as issuing treasury stock below par has been allowed. An agreement setting out the whole terms of the contract has to be fyled, and it is open for anyone to examine, so that the whole history of the thing can be seen. There has been this trouble on our side, that company shares have been used too much as gambling counters on the stock exchange. One has to take risks, but there is too much dependence on the front page of the prospectus People don't examine the enterprise so much as they look at the front page of the prospectus. I think that Canadians would do well to assimilate their company laws on the English model The whole intention of the Act was to make company promotion a more honest occupation I hope that the effect of an endments on our side will result in more attention being given to the purity of company law on this side, and of the assimilating of your company laws more closely with ours I do hope it will be possible to open up some reciprocal connections on our side with men who will be willing to introduce Canadian stock, without necessarily putting it under English administration, which is more costly than Colonial in these matters. May I venture to make a suggestion that various mining organizations, I mean organizations of mining men, will be doing a service to English investors by having a sort of bureau of engineers whom they can recommend, not only for the higher positions but also the junior positions in the mine. It would be a real boon if this Institute were to make that provision I would like to pay my tribute to Mr. Clark for having brought this subject forward, and probably the effect of it will be that you will study English law a little bit more, and perhaps make some amendments in the direction I have indicated. I sincerely hope that the effect of a wider knowledge and greater interest on our side, and the enormous strides on this side, will be that you will do all in your power to justify the confidence many feel in your resources, and the conviction that we can trust our money to capable men, who will see that our interests are taken care of, although so far removed from home—(applause)

MR. LESLIE HILL (Vancouver)—I was much interested in hearing the paper and getting some information about the English Company Act I feel very strongly about the disadvantage of the issuing of shares so very much below par, and I think it is a very unfortunate way, and has led to a great deal of trouble. It would be much better if we could assimilate our law more to the English law, so that it would be more unfform. I think it would give confidence in England.

Mr. CLARK—Perhaps I should have pointed out that when I was talking of issuing stock at a discount I was speaking of provincial Acts. The Dominion Act is practically the same as the English law was before the passing of the recent Act to which I have alluded. Under the Dominion Act, a company having a Dominion charter cannot issue shares at a discount, and they must be paid in cash, unless an agreement is filed with the Secretary of State. The only difference between the Dominion act and the old English law was that the agreement had to be fyled with the Secretary of State in Canada, and in England with the Registrar of Joint-Stock Companies Very few of our companies have been incorporated under Dominion law.

Mr. LOWLES—What percentage, do you know?

Dr. CLARK—About one in a hundred.

Mr. RUFUS H. POPE, M.P., at the request of the secretary, made a few remarks He expressed pleasure that the English act had been improved, as when he was over there on a visit he thought criticism might be offered on their methods of doing business. We required capital very badly in Canada in our mining business, and many of us had felt, when we went to England, that there was too much money wanted to remain in London before it found the mine. A large portion of the money of Canada was locked up in the banks of Canada. Bank directors had to be exceedingly cautious, and the older they got, the more cautious they grew, until the became of no use either to this country or anywhere else. It had come to this stage to-day, that if you went to a bank with the best possible paper, no matter whose good names might be on it, the bank would ask if the money was to find its way into mining in any shape or form. If the answer was in the affirmative, the money was refused. Therefore it would readily be seen why we were particularly short of capital. He considered this a reflection upon the whole mining industry of this country. Bank directors were quite right in shutting down on matters which had no basis; but when a property had become a sure fact, and required a little more money to complete it, he did not see why banks should not consider good names in the same way as they would for a pulp mill or any other factory. Mining was just as essential as any factory for the advancement of the country. It was about time that the Dominion Parliament told these gentlemen that they must be patriotic as well as business-like in the use of the public money which Parliament gave them a charter to lock up—(Applause).

Prof. W. G. MILLAR presented his paper on "The Iron Ore Fields of Ontario," which, after discussion, was followed by one from Dr. H. M. AMI on "The Sedimentary Formations of the Province of Ontario, and Boring Operations carried on in them."

After discussion, the members adjourned at six o'clock.

ANNUAL DINNER.

In the evening about seventy members and their friends sat down to dinner in the Windsor Hotel. After an excellent collation, a thoroughly enjoyable evening was spent in song and sentiment, speeches being limited to three minutes. A splendid programme of vocal and instrumental music was carried out under the auspices of the Zingari Glee and Banjo Club, who most generously volunteered their services for the occasion.

Sultana Mine of Canada.

The accounts covering the operation of this company for the year ended 30th September, 1900, show :—

BALANCE SHEET, 30TH SEPTEMBER, 1900.

Dr.

	£ s. d.	£ s. d.
To Capital authorized	275,000 0 0	
Issued—		
,, 225,000 Shares of £1 each, fully paid, allotted to vendor	225,000 0 0	
,, 13,507 Shares of £1 each, fully paid	13,507 0 0	
,, 1,200 shares of £1 each, 5s. paid	300 0 0	238,807 0 0
,, Sundry Creditors—		
London	911 8 8	
Canada	2,995 4 3	3,906 12 11
		£242 713 12 11

Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bank, London	402 0 10	
,, Canada	129 12 11	
In hand	2 9 11	534 3 8
,, Property, buildings, and equipment taken over as per contract, 26th July, 1899, subject to Vendor's encumbrances, not exceeding £10,000, against which encumbrance Vendor has deposited 50,000 fully paid shares		225,000 0 0
,, Further expenditure—		
Mine development	9,455 15 0	
,, Assay house	11 9 10	
,, Boat	19 2 6	
,, Building	1,118 0 9	
,, Boarding house	36 11 6	
,, Electric light	63 19 8	
,, Mill	336 15 2	
,, Mine	2,110 4 8	
,, Power plant	84 6 5	
,, Office	29 10 9	
,, Stable	9 6 10	
,, Machine shop	147 7 3	
,, Sleeping camp	28 16 2	13,451 6 6
,, Vendor—		
Paid on his account		404 3 0
,, Stores and materials		585 6 4
,, Preliminiary expenses		1,307 5 4
,, Loss—		
Pe Profit and Loss account	986 18 7	
Add September wages not yet paid or apportioned	444 9 6	1,431 8 1
		£212,713 12 11

PROFIT & LOSS ACCOUNT, 14TH AUGUST, 1899, TO 30TH SEPTEMBER, 1900.

Dr.

	£ s. d.	£ s. d.
To Canadian expenses—		
Assay account	162 4 6	
Boat account	128 9 4	
Electric Light account	12 9 3	
Insurance, Fire	145 4 7	
Insurance, Accident	150 8 3	
Management ,,	389 0 1	
Mill expenses	723 18 10	
Mine ,,	4,052 9 3	
Office ,,	113 15 3	
Stable ,,	17 14 6	
Sleeping Camp	7 6 10	
General expenses	121 6 2	
Interest and discount	7 11 3	6,181 18 1
London expenses—		
Printing, stationery, cables, and postage	177 10 6	
Secretarial expenses and rent	291 13 4	
Directors' fees	500 0 0	969 3 10
		£7,151 1 11

Cr.

	£ s. d.
By Bullion	5,937 9 2
,, Boarding house	63 3 2
,, Exchange	9 16 9
,, Transfer fees	3 6 0
,, Rents	150 8 3
,, Loss	986 18 7
	£7,151 1 11

War Eagle Consolidated Mining & Dev. Co.

The accounts of this company submitted at the annual meeting on 26th ulto., show :—

FINANCIAL STATEMENT

FOR THE YEAR ENDING 31st DECEMBER, 1900.

ASSETS.

Mines and Mineral Claims	$1,701,176 39
Cash on hand and in bank	2,107 19
Stores on hand	19,365 84
Machinery, buildings and equipment	227,624 62
Furniture of Offices	1,840 55
Monita Gold Mining Co.'s Stock	89,549 94
Mugwump Gold Mining Co.'s Stock	28,336 88
Rossland Red Mountain Gold Mining Co.'s Stock	56,190 20
War Eagle Hotel Co.'s Stock	12,000 00
Accounts receivable	27,353 81
Profit and Loss	197,514 93
	$2,363,060 35

LIABILITIES.

Capital Stock	$1,750,000 00
Bank of Toronto, Rossland	255,608 27
George Gooderham	351,462 00
Accounts payable	5,990 08
	$2,363,060 35

PROFIT AND LOSS ACCOUNT.

DR.

To Cost of Mining and developing War Eagle Mine, including salaries, wages, Directors' remuneration, office and general expenses	$272,266 67	
" Diamond Drill Prospecting	20,598 18	
" Consulting Engineers' fees	4,850 00	
" Hoist and Compressor Litigation	6,200 68	
" Other Legal Expenses	1,430 67	
" Mine Accidents	72 05	
" Interest and Exchange	15,495 32	
" Travelling Expenses	358 94	
" Auditor's Fees	200 00	
" Crown Point Expense	15 50	
" Richmond Group Expense	319 78	$321,807 79
" Dividend No. 21		26,250 00
		$318 057 79

CR.

By Balance	$74,989 09
" Net Proceeds from Ore Sales	74 431 08
" Transfer Fees	325 55
" Amount received from Insurance Co. re Pender Damage Suit	797 14
" Balance	197,514 93
	$348 057 79

Athabasca.—The annual report covering the work on this Nelson Mine to January 1st, 1901, gives the product for the year as $170 668, obtained from 5,054 tons of ore, the profit being $29,551 The cost of mining is still high. In development 1,921 ft. was done at a cost of $29,0 4, or $15 10 per foot. The milling cost was $14 97. Ore and waste mined, 28,176 tons. Cost per ton, $2 69. Total cost of development was $29,014; and of extraction, $75,712, making a total of $104,726. The net profit in 1899 was $31,500.

Centre Star.—The company has announced the 5th dividend of 1c., or $35,000, payable April 1st, making $175 000 paid by the new company to the date mentioned. About 2 500 tons of ore are shipped weekly to the Trail Smelter, and this amount is likely to be increased.

COMPANY NOTES.

The Crow's Nest Pass Coal Company, Limited.—The annual report of this Company dated 1st. March is as follows:—

The Net Profits for the year after paying all operating expenses and all charges of every kind at Head Office and Mines, amounted to $141,064.10. This amount has been derived from the various departments of the Company's business, viz: the sale of coal and coke, and from waterworks, house rentals, general store, etc., etc. As no dividend was paid for the year on the Company's Capital, the above sum has been carried forward to credit of Profit and Loss, making a total sum at credit of that account (including the amount already there from the earnings of 1899) of $188,874.52.

The coal produced during 1900 amounted to 220,458 tons. Of this tonnage 114 063 tons were sent to the Company's coke ovens at Fernie, and produced 73,496 tons of coke, while the balance of 106,395 tons was disposed of as merchantable coal.

During the year the Company paid out in cash the sum of $874,080.83 of which the pay rolls amounted to $419,037 09 the balance of $454,943.74 having been disbursed for new coke ovens, additions to plant and for development work at Fernie and Michel. One hundred and ten (110) new coke ovens were built in 1900 which makes with the 202 in operation at the end of 1899, a total of 312 ovens with a capacity of over 450 tons of coke per day.

The number of men at present in the Company's employ is about 800 and this number will of course steadily increase as our mines are developed.

The Financial statement at 31st December, 1900, shows :

ASSETS.

Mines, Real Estate, Plant, Development, etc., etc.		$2,266,016.65
Cash in Bank	$37,501 62	
Accounts Receivable	67,005.42	
		104,507.04
		$2 370,523.69

LIABILITIES.

Capital Stock Paid-up		$2,000,000.00
Profit and loss Account:—		
Balance at Credit 31st. December 1899	$ 47,810.42	
Added in 1900	141,064.10	
		188,874.52
Bills Payable	$121,795.72	
Accounts Payable	59,853.45	
		181,649.17
		$2,370,523.69

Granby Consolidated Mining and Smelting Co.—The success of the smelting plant established by this company at Grand Forks is giving great satisfaction to the shareholders of this enterprising company. The plant consisted of two rectangular water jacketted furnaces, 44″ x 160″, with all the necessary appurtenances incident to a modern copper smelting plant. It was installed at Grand Forks, B. C., to handle the low grade copper ores in the Boundary District, and was designed to handle 500 tons per day. Under the direction of the Superintendent, Mr. A. B. W. Hodges, the plant has averaged 600 tons per day, and has reached as high as 763 tons. The Company has, within the last month, completed smelting its first one hundred thousand tons, and has reached a low cost of mining and smelting that has made a new record.

To complete this plant the Granby people have just placed their second order with the Gates Iron Works, Chicago, consisting in part of two more water jacketted furnaces, 44″ x 160″; a complete ore crushing and sampling works, with No. 5 Style "D" crusher, one 9″ x 15″ Blake crusher, one "F" Gates crusher, one sample grinder, three sets of rolls, elevators, etc; a complete Silica crushing mill, including a Dodge crusher, dry pans, rolls, elevators, etc., and the following converting machinery: one tilting reverberatory furnace complete, one converter stand complete, cars, a complete hydraulic system, blowing engine; one ten ton electric crane, one forty ton electric crane, with everything complete to make a perfect plant.

British American Corporation.—The local officials of this company have been notified that their services will not be needed after April 1st, but they will all be re-engaged as officials of the Rossland Great Western. The change is due to the voluntary winding up of the British America Corporation in London. It floated the Le Roi, Le Roi No. 2, Rossland Great Western, and Kootenay Mines, which will now stand on their own merits. The officials in Rossland concerned are General Manager Bernard Mcdonald and his assistants.

Intercolonial Coal Company.—The annual meeting took place March 7th at the office of the company in Montreal The sales of coal and coke for the year ended December 31st, 1900, amounted to 225,869 tons. The following gentlemen were elected directors for the ensuing year: Messrs. James P. Cleghorn, W. M Ramsay, Thomas Wilson, E. G ff Penny, A. W. Hooper, R. MacD Paterson, Charles Fergie and F. C Henshaw. At a subsequent meeting of the board, Mr James P. Cleghorn was re-elected president; Mr. Charles Fergie was re-elected vice president and general manager; and Mr. D. Forbes Angus was re-appointed secretary-treasurer.

Dominion Copper Co.—James Breen, manager of the Dominion Copper Company, has been in the Phœnix Camp recently in consultation with J. H. Parker, the superintendent. For the last three months development on the Brooklyn, Stem-winder, and Rawhide has been actively prosecuted by Mr. Parker, and although nothing official is given out, it is known that in the two first mentioned properties the results have been more than satisfactory. The Brooklyn is the only one equipped with an air compressor, but a large force was put at work on the Stemwinder at hand drilling. In this mine the work was largely drifting, and valuable ore bodies were opened up. It was the intention to put a five drill compressor on the Stemwinder temporarily for use till the large 20 drill plant was available, and excavations for the foundations of the smaller plant were made. This plan has been changed and part of the Stemwinder force laid off. This week the company began development work on another of its claims - the Idaho, which adjoins the Brooklyn on the south. A double compartment shaft is being sunk about 250 feet west of the old 50-foot shaft. It is understood that no time will be lost in proving up the immense ore bodies, which have a phenomenal surface showing. The Idaho has long been known by old timers as one of the best properties in the Bounday.

Le Roi Mining Co.—The manager at Rossland cables :—"The following amount of ore has been shipped from the mine to the smelter, 12,394 tons, yielding 5,309 ozs. gold, 9,207 ozs. silver, 129 tons copper, value £31,830. The smelter shipped $334,000 worth matte for the entire month." (Office note—"The decrease in returns is caused by a break-down in the old shaft, which occurred about the middle of the month, having rendered inaccessible for the time being the ore body east of the shaft, from which the principal supply of ore was being stoped.")

Cordova Exploration.—Under Mr. Kerr this company is making splendid progress with the opening up and re-equipment of their Belmont mine. The new 30-stamp mill is 175 feet long, 90 feet wide, and 85 feet from lowest to highest point. It is substantially built, neatly finished and painted, and well lighted. The 30 stamps are driven by a Corliss engine of 150 h.p. The engine and shaft have been put in strong enough to extend the mill and drive 120 stamps if necessary. Pulleys on main shaft to drive stamps are equipped with friction clutches, so that ten stamps can be hung up completely without slowing the engine. From the side of the engine is a 6-ft. driving pulley up to stone breaker counter shaft. Crushers are two, one 10 by 20 and a smaller one 7 by 10. The mill in this part has ore bin capacity of 600 tons. The crushed ore, on leaving the mortar boxes, flows over plates 36 feet long, having a series of 10 drops. From there it passes over 6 Wilfley tables, driven by a separate engine, which has a capacity for double that number. Below this floor is the new cyanide plant. It consists of three large circular steel leaching vats, 15 feet in diameter and 4 ft. deep. Below these are two circular steel tanks, 7 by 2 ft., and further below are zinc boxes where the gold is precipitated. Below these are two sump tanks 9 by 4 ft, and also three wooden acid tanks, on this floor. Above the leaching vats are two other steel tanks 10 x 5 used for storage. This is the first cyanide plant ever used in this district. The cyanide plant is in charge of W. H. Whytock, who spent five years in the Rose Deep Mine in South Africa. The stamps and tanks were manufactured by the Wm. Hamilton Company, of Peterborough. The engine and boiler-house attached to the mill is 80 x 40 ft., with a hall-way 6 ft. wide through the centre to enter the mill. The engine-room on north-west side is substantially built with 18 feet ceiling, and contains the Corliss engine already mentioned. The old mill engine is used for driving the dynamos for electric lighting. The boiler house contains 2 horizontal tubular boilers, set in brick, with space for a third. There are the usual feed pumps, with National Heater to heat water by exhaust steam. Electric current for lighting is generated by two dynamos, driven from counter shaft by clutches. One generates current for the day, when light is used in the mine, and the other for night. It is a three-wire system, this being preferred for its convenience, safety in mine, and for better insurance rates. There are abundant lights throughout the mine, shafts, mills, shops, office, manager's residence, store, boarding-house for the staff, etc.

Behind the mill is a large tank house 112 by 20 by 20, connected with the mill by a passage. It contains 7 large water tanks 15 feet in diameter, 12 feet deep with capacity to hold 75,000 gallons. The water supply comes from No. 1 shaft. The assay office consists of a brick building in two parts 20 by 28 and 20 by 20 feet. The larger part contains a sample grinding room, where will be installed a motor sample grinder stone breaker, underneath the floor of which is a 20 by 20 cellar for coke, and a furnace room 20 by 18, equipped with combine gasoline furnace and muffle. The other part consists of a laboratory, 20 by 20, an office 10 by 10, and a balance room. The building is heated by furnace.

Several additional machines have been added to the machine shop. It is fitted up with a large turning lathe, 6-ft. planing machine, 2 drill machines, pipe cutting and screwing machine and bolt screwing machine, driven by a small air engine. This, together with the three blacksmith shops, on the mine, enables them to make and repair any part of the machinery. The air compressor is a frame building 140 by 60 feet and contains a cross-compound air compressor with intercooler and aftercooler condenser, 185 H. P., with air receivers and air line from air receiver to the various shafts; 2 return tubular boilers in separate rooms with electric damper regulators, large water tank, 7,000 gallons capacity, for coolers At the mine there are 10 shafts the deepest being down 400 feet. No. 2 is down 185 feet and No. 3 is 250 feet. None of the others is yet over 100 feet. A large amount of drifting and cross-cutting has been done

The property consists of 425 acres at the mine, 300 of which is in the township of Belmont and 125 acres in Marmora. At Deer Lake the company has 160 acres also.

The company owns a most admirable water-power at Deer Lake, a distance of 2½ miles from the mine. Two dams have been built at the foot of the lake. The large dam is 80 feet long, 12 feet high, 13 feet thick at base and 5 feet at top. It is built of concrete and cement masonry. The other dam has a timber slide 20 feet wide for use of lumbermen, and also a sluice gate to admit water to flume pipe 7 feet square. It is contemplated to instal a large air compressor and bring air to the mine through a 10-in. wrought iron pipe, which will then supply power for the whole mine. Manager D G Kerr's plant is to have ample stamp capacity in his mill and power cheap enough that the lowest grade ores can be thoroughly treated at a low cost.

A tramway has been built, commencing at the level of the top of the mill. Ore is hauled along this tramway (level with top of mill) in cars containing 10 tons, by one horse. This tramway forms a perfect circuit for collecting the ore from all the shafts.

LAKE OF THE WOODS.

At the *Stella* the shaft is down about 165 feet.

At the *Mammoth*, north of Black Sturgeon Lake, the shaft is down 55 feet, and at that depth a cross-cut of the vein has been started. The gangue contains a large percentage of pyrite.

The *Boulder* Mine on Camp Bay is starting up again ; teams with supplies, &c., left Rat Portage for the mine today.

A gang of men will in a few days be sent out to the *Homestake* Mine to recommence mining operations.

The only news about the *Wendigo* is not of a very cheerful character, it being to the effect that the unpaid miners had been offered twenty-five cents on the dollar as a settlement. The miners have refused to accept this.

It is reported that a new company is to take hold of the *Regina* mine, putting up $100,000.00 for a three-fifths share in the property, the vendors retaining two-fifths.

The *Champion* Mining Co. is gazetted, with a capital of one million shares. This is the old *Bad Mine*, and is about eight miles from Rat Portage.

Eagle Lake.—On Prendible Island the drift is in about 90 feet the shaft is down 60 feet, and sinking will now be resumed. The vein is promising.

Close by the above Messrs. Prendible and Bruce have begun development of a fine-looking vein on one of their islands. This is a strong vein of quartz right in the contact, having the Huronian schists on one wall, and the eruptive granite on the other.

Mr. Partington is showing in his store a chunk of very rich gold quartz taken from the Partington-Farmer's claim near Prendible Island. Some of this phenomenally rich quartz has been sent to the Buffalo Exhibition.

A prospector has just come into town from Eagle Lake, bringing some rich gold samples from a recent find.

The Anglo-Canadian Gold Estates Co. are going to test some gold properties with a diamond drill this spring.

There will probably be quite a rush of prospectors to the Sturgeon Lake country north of Ignace, when the snow goes.

Rat Portage, March 21, 1901. J. M.

Winding From Great Depths.

In deep winding, as usually carried on, a great load has to be set in motion, made to attain a high velocity, and again be brought to rest within a very short period of time ; the engines and the winding apparatus have to be well up to the work and under perfect control, whilst the rope must be of the highest quality and must be carefully treated. It should, therefore, not be allowed to overlap on the winding drum, nor should it be allowed to "angle," that is, get out of the direct line of winding and suffer undue friction against the rim of the pulley. The prevention of these undesirable features incident to winding a great length of rope on large stationary cylindrical drums of small diameter has led to the introduction of many modifications. These and other disadvantages of ordinary winding are well shown in the second of a series of articles which appears in the "Engineer" of February 22nd ; and clear illustrations are given of the Koepe system which is designed to overcome such drawbacks. The Koepe system, says our contemporary, introduced into Germany some thirty years ago, had in the place of the drum a single grooved pulley and two headgear pulleys ; a single winding rope was employed, and it passed from one cage over its headgear pulley, round the winding pulley, over the second headgear pulley to the second cage, whilst beneath the cages a balance rope was used connecting them together and passing round a pulley at the bottom of the shaft, by which means the descending rope, cage and empty wagons balanced those ascending, thus leaving the weight of coal or other mineral as the only and constant load against the engine throughout the wind. The Koepe system has its advantages. With the pulley in place of the bulky heavy drum, smaller engines placed closer together with a shorter crank shaft may be used. The engine house, too, may be smaller ; only one rope may be used for winding, which always coils round the same diameter, and is subject to uniform flexure, avoiding the baneful influence of irregular bending. There should, moreover, be no "angling," and the load is uniform throughout the wind. An objection to it in its original form was the liability of the rope to slip ; and further, when the cages rested on the stops, the weight being taken off the rope, it no longer had sufficient adhesion on the motive pulley to enable the load to be restarted. There was also the difficulty in re-capping the ropes, and more serious still was the probability that in case of injury to the winding rope, both cages would be precipitated down the pit. These objections have since been overcome to some extent, consequently the system has some vogue in Germany, but has not gained ground here.

Briefly, by the Koepe system the winding can be done more economically, with comparatively small engines and plant, and with less liability to overwind than with drums, but there is the danger attendant on the rope breaking, the extra trouble in capping the ropes, the extra stress on the cappings, the slipping, and the unsuitability of the system for lowering or raising heavy loads such as are occasionally required to be dealt with at mines ; and somehow these disadvantages have stood in the way of its more extensive employment.

Frank B. Smith, B.Sc.

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THE DOMINION IRON AND STEEL COMPANY, of Sydney, Cape Breton, is about to start its second furnace. The dates fixed for the third and fourth furnaces are May 1st and June 1st respectively. These 4 furnaces will give a total daily capacity of 1,000 to 1,500 tons. The steel mill will be in operation in October for the manufacture of billets, and January 1st, 1902, for rails and plates. Iron from the company's plant is being offered in New York.

ATLIN MINING COMPANY.—Advice has been received that the mining plant to be erected on this company's property was shipped from Vancouver on the 14th February. Everything possible has been done to ensure operations commencing the moment the weather permits, and it is expected the hydraulicing will be started before the end of June.

TYEE COPPER.—The Secretary has issued the following circular to the shareholders under date the 6th inst:—"A report for the month of January has been received from Mr. W. Pellew-Harvey, in which he states that the progress for the month consists of 115½ feet of driving, cross-cutting, and upraising at the 200 feet level. The amount of ore now developed on the 200 feet level is estimated by Mr. Harvey to be 28,000 tons, which he states will yield about $10 per ton profit when sorted and treated in the Company's own smelter. Mr Pellew-Harvey is of opinion that by the end of May the mine should be sufficiently opened up to be in a position to give a continuous supply of ore for smelting. The following cablegram has been received from Mr. Clermont Livingstone today—'We have struck ore (in) crosscut (from) east drift (at) 250 feet.' This proves another 100 feet of the ore body on the same level."

LARGE ORDER FOR NICKEL FROM NEW CALEDONIAN MINES.—It will doubtless be pleasing to the export nickel tax agitators to learn that their efforts have again alarmed the Orford Copper Co., so to protect itself it is negotiating for the purchase of 35,000 tons of New Caledonia ore, to be delivered during the next ensuing twelve months. This quantity of ore will contain about seven million pounds of nickel, and will prove a serious menace to the enlargement of operations at Sudbury, for it will supply a requirement of the Orford Copper Co. which otherwise would have been supplied by Sudbury.

SYDNEY STEEL PLANT.—The steel plant at Sydney, C. B., is an emphatic success. Cornelius Shields, vice-president and general manager of the Virginia Coal & Iron Co. and one of the best informed iron men in the United States, has been in Sydney and he says:—"I think that the Dominion Iron & Steel Co., will have a plant equal to any of its kind in the United States."

THE MINE MANAGER.—Mr. Hugh Murray gave his views of what constitutes an efficient mining manager, summing up the necessary qualifications in the following terms:—"This ideal manager is argus eyed and his vigilince is sleepless. He is a disciplinarian, a martinet, not to be gainsaid or trifled with, but his men enjoy the maximum of safety in their occupation. With him waste and extravigance are cardinal sins. He sees that not too much cotton waste is lying around in the engine room, that the oils are not used too profusely or thrown broadcast around; that ties and props are not thrown into the gob or left in worked-out rooms to rot; and that economy in the use of supplises is practied in every department. Above all he is economical of minutes. His mules and mule drivers never wait for anything, and never collide or interfere with each other in making their trips. Tools and timbers are always ready for the man that needs them, and there is no delay while they are being brought from the top. Every man in and about the mine has his work to do, and every man does it, two men always doing the work of two men, and not that of one and a quarter. The one aim and ambition of this man is to get out more coal to-day than ever he has done before, and he lays his plans at a day six months hence to reach an output hitherto never thought of. Thus planning, and with this object in view, he places his mine in a condition, as to efficiency, that leaves nothing to be desired.

Mine Pumping by Hydraulic Power.

When we remember that the difficulty of pumping a mine increases very much with the depth of working, the question of doing so efficiently is one of great importance. The Rhenish-Westphalian collieries will soon have to encounter such difficulties, for they are on the point of encountering coal measures at such a depth that henceforth shafts more than 270 fathoms deep will have to be sunk. Some indeed have already been sunk to a depth of about 437 fathoms. With such depths the use of under-

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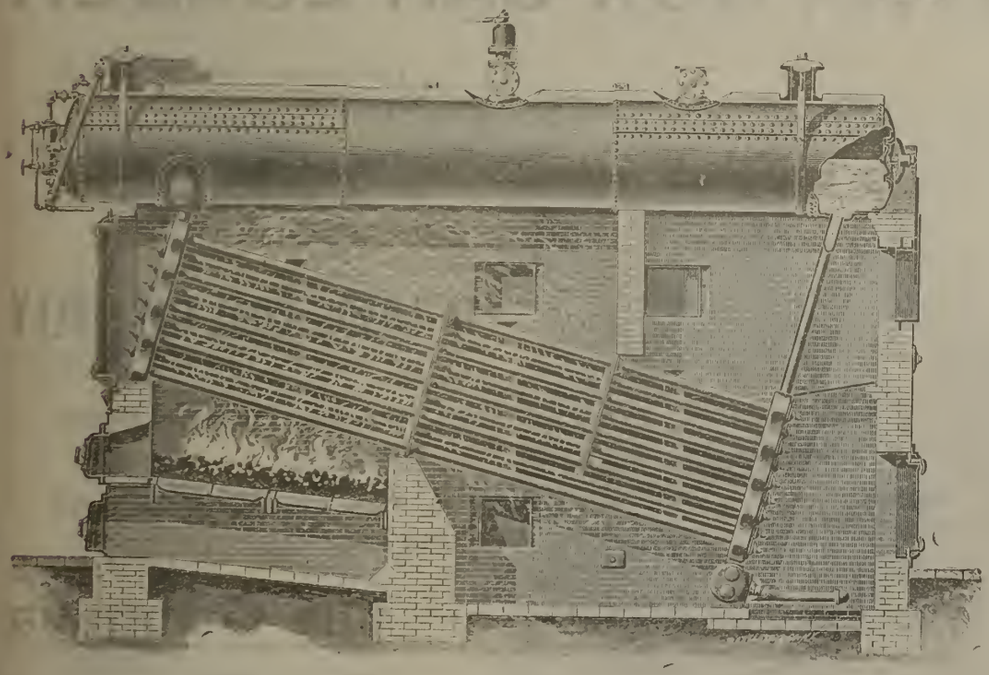

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ground steam engines is hardly practicable, because there is great loss through condensation in the long line of steam pipes, and the water supplied for condensation is not sufficient even for very economical engines. Moreover, the heat set up in the shaft by the long line of steam pipes causes great difficulties, necessitating the supply of large quantities of air for ventilation. It is true that the use of highly super-heated steam permits the working to be carried a few metres deeper; but that limit is soon reached. Engines with pump-trees are out of the question, for depths of 500 metres and upwards, first on account of their great cost and slight useful effect, and secondly owing to the great space they occupy in the shaft and round its mouth. In a *Colliery Guardian* note, from which we extract the above, the writer says that for this purpose compressed air is not to be thought of, so that for an economical pumping plant there is only the choice between electric and hydraulic power transmission; and although at first sight the former appears to offer greater advantages for underground pumps, a closer examination soon reveals several disadvantages. First and foremost an electric plant is far more delicate and difficult to keep in order than the hydraulic; the high-tension currents afford a constant source of danger to the work-people, that must not be under estimated under the hard conditions of mining; and again, in the event of sudden inbursts of water, the electric pumping plants are irremediably drowned if the motor should become flooded. On the contrary, pumps worked by water under pressure free themselves in such a case, and also start at once, after standing for some time under water, directly the motive water is admitted. Lastly, the collective useful effect is far higher with hydraulic than with electrically worked pumps, as "Gluckauf" proceeds to show in an article founded on lectures by Engineer Frohlich, of Berlin, arriving at the conclusion that the Kaselowski system is most economical, and the favour with which it is received in the Dortmund district is abundantly proved by the many plants supplied by the Berliner Machinenbau-Aktiengesellschaft. We cannot agree with our contemporary in the opinion that compressed air is inadmissible for pumping. The great advantages which air offers in respect of safety and ventilation render it, in our opinion, an ideal motive power for use in mines.

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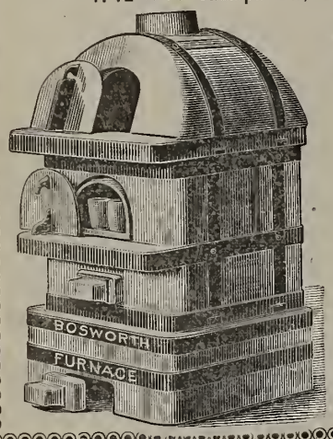

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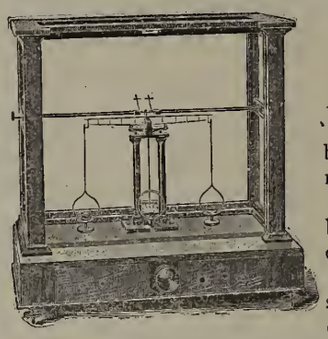

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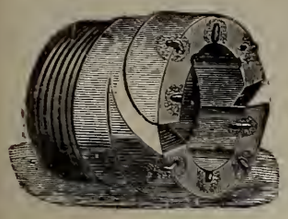

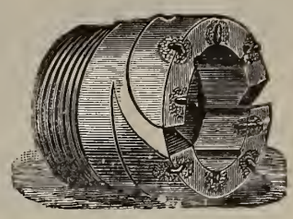

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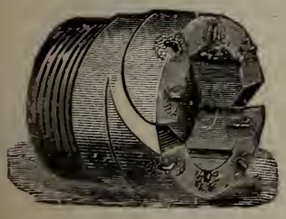

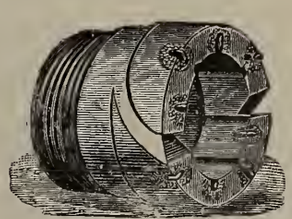

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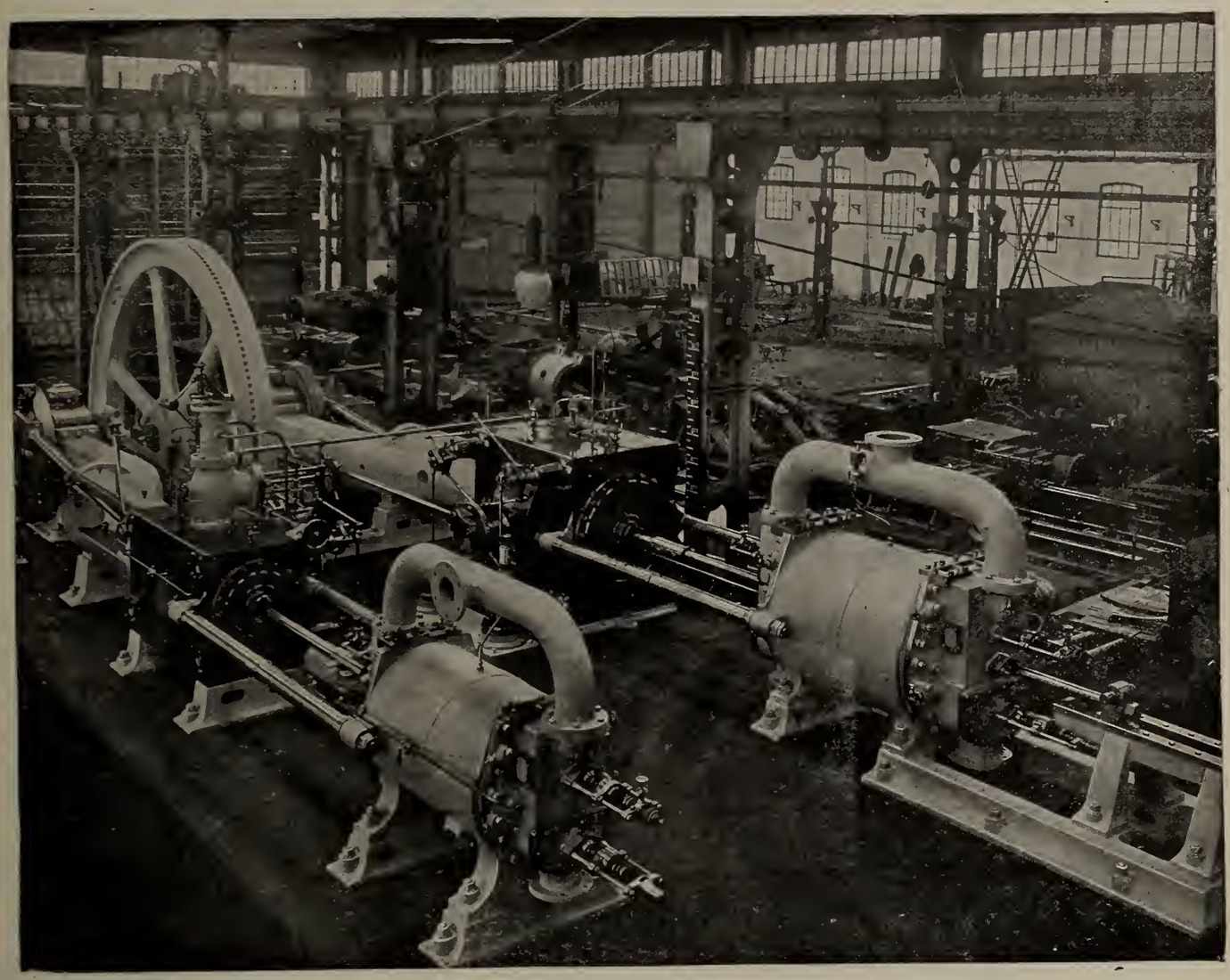

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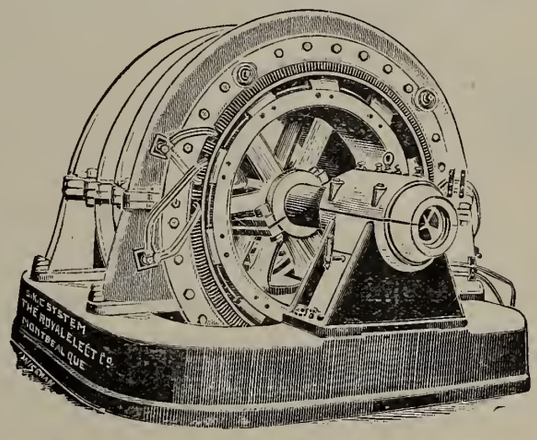

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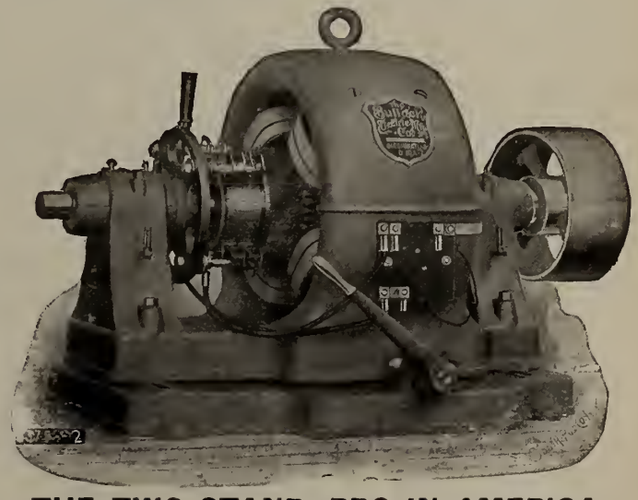

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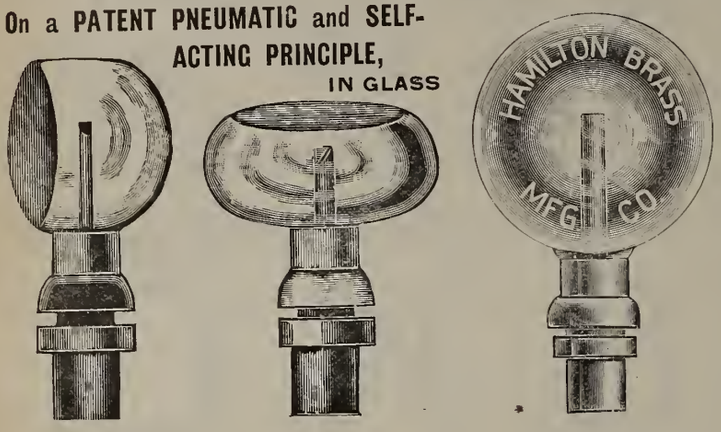

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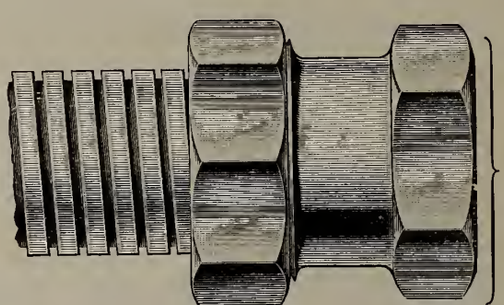

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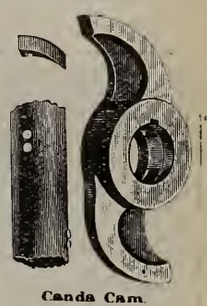

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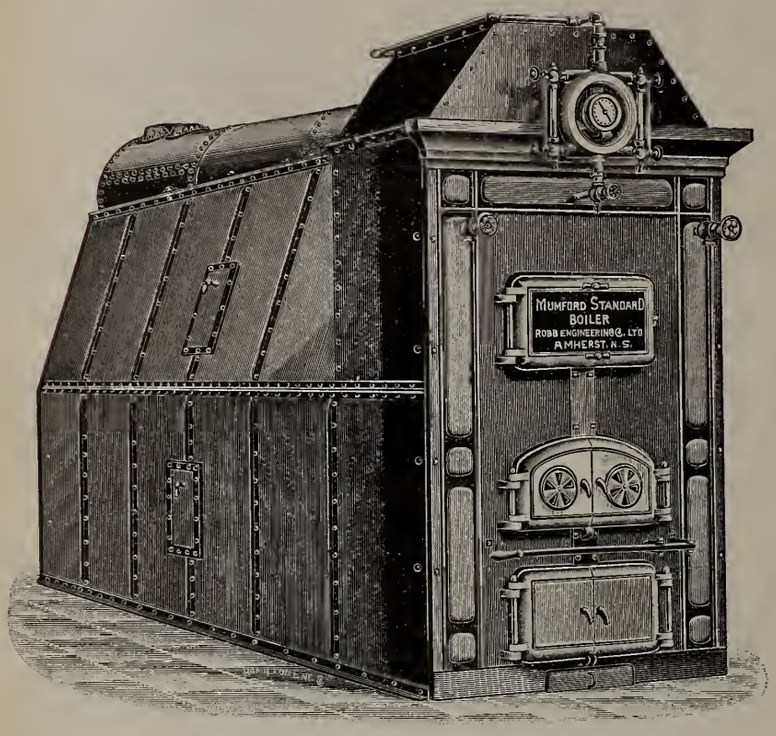

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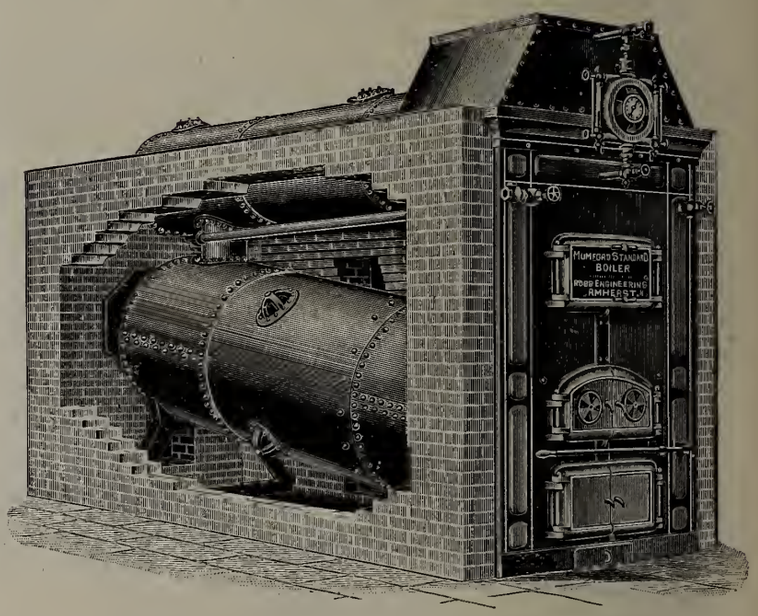

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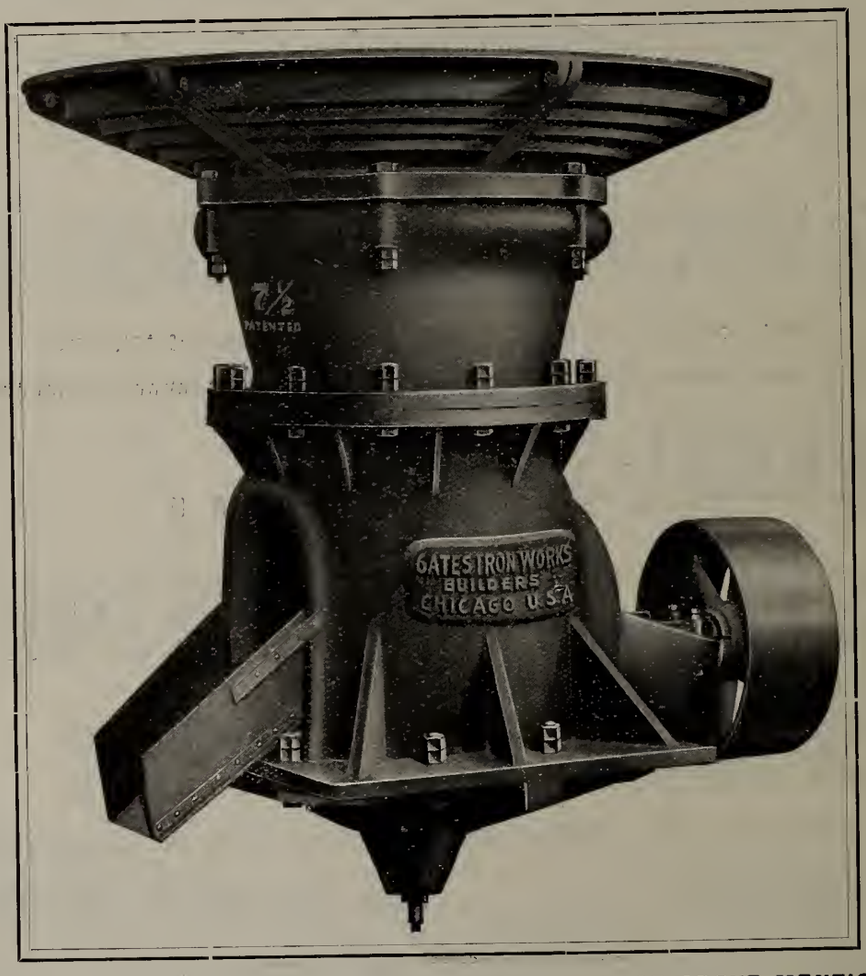

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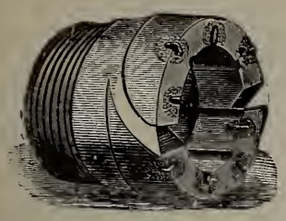

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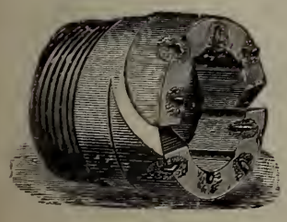

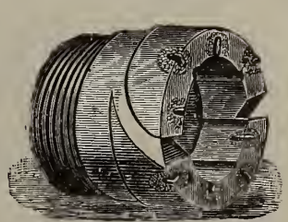

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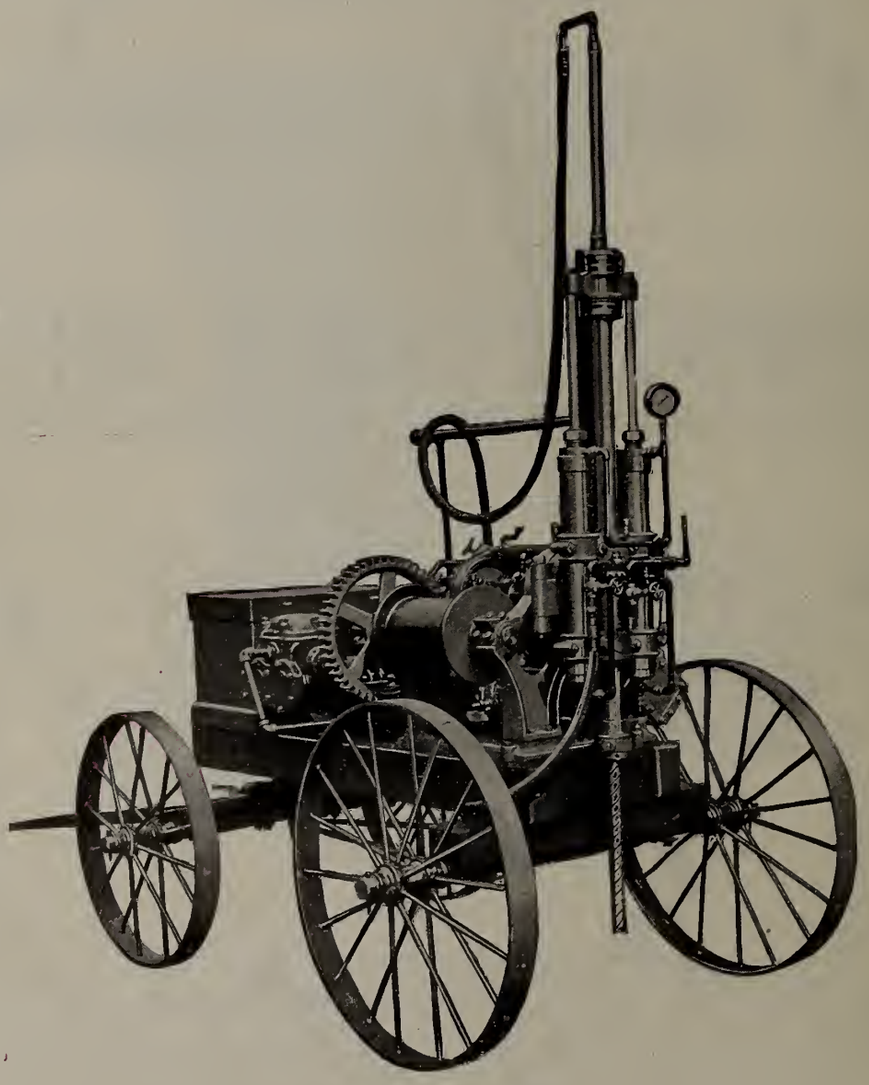

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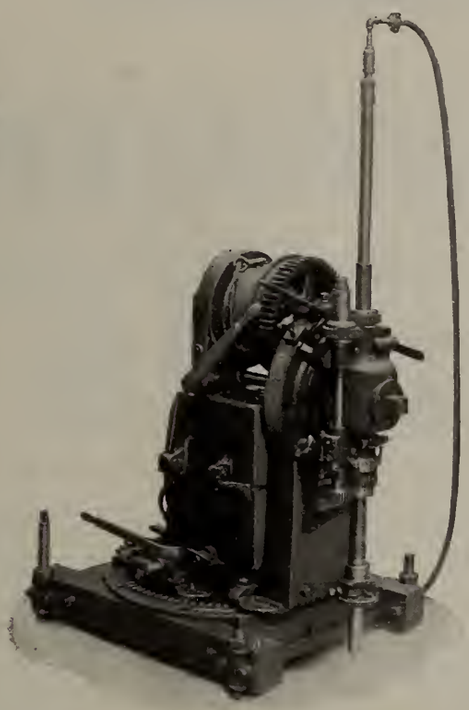

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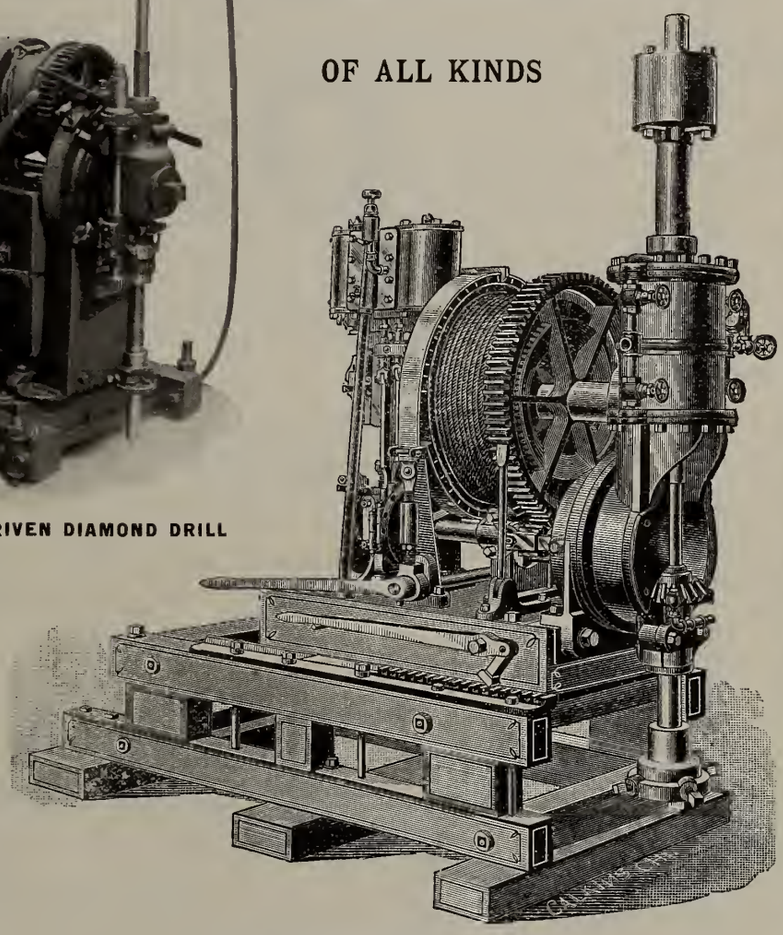

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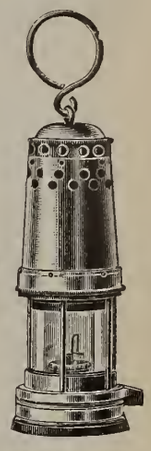

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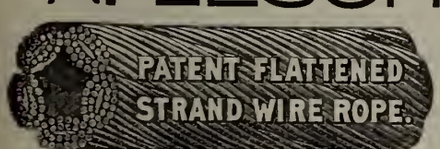

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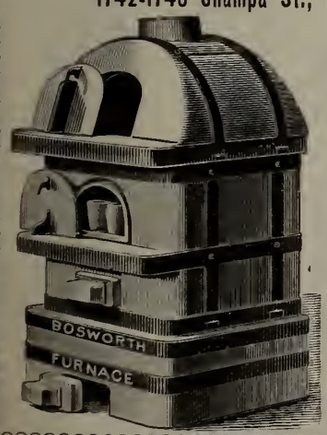

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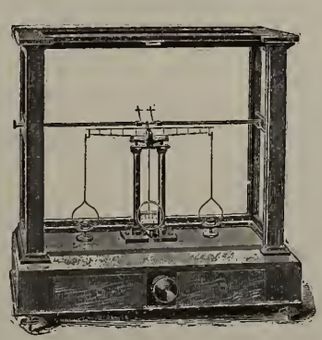

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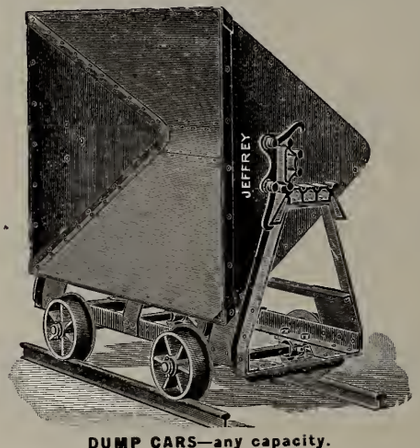

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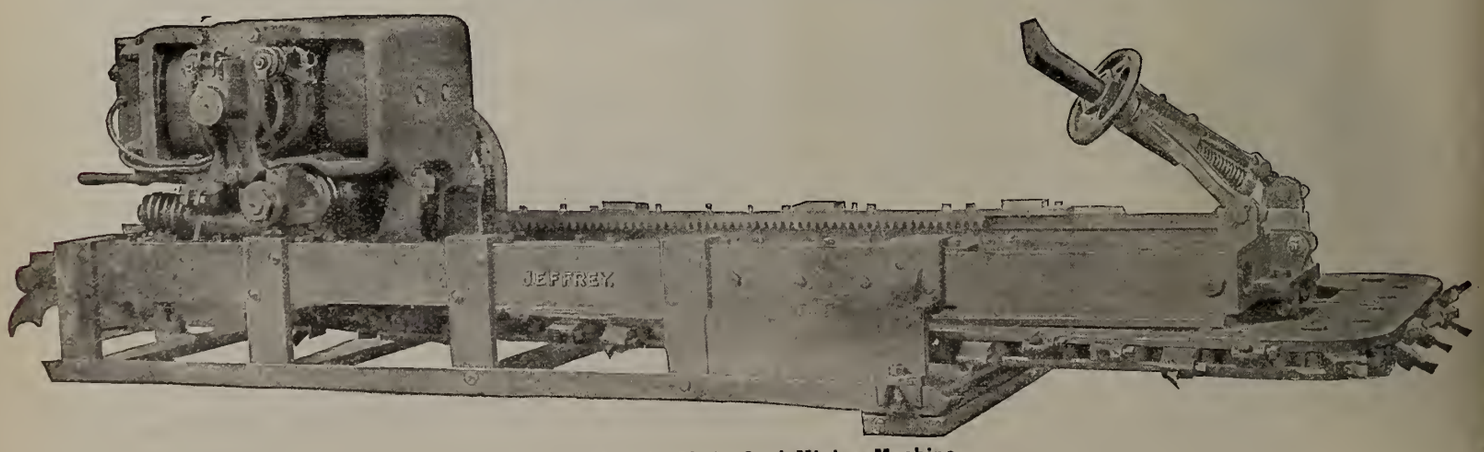

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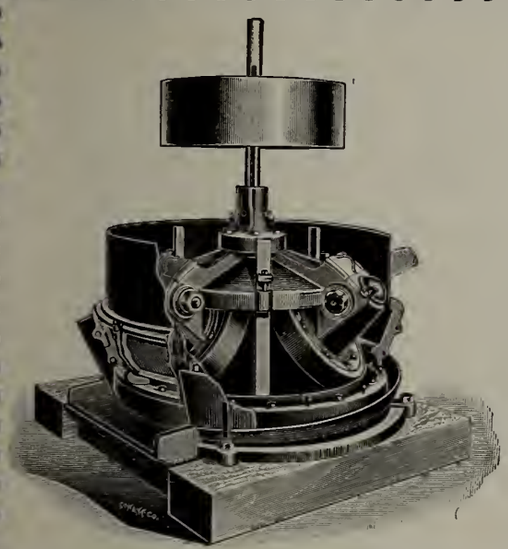

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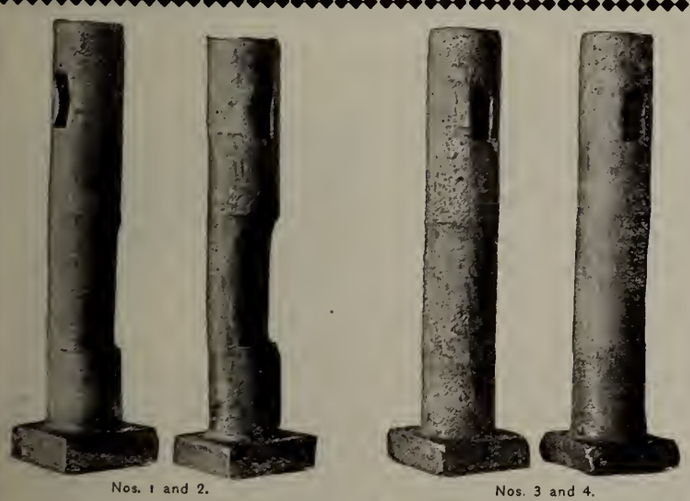

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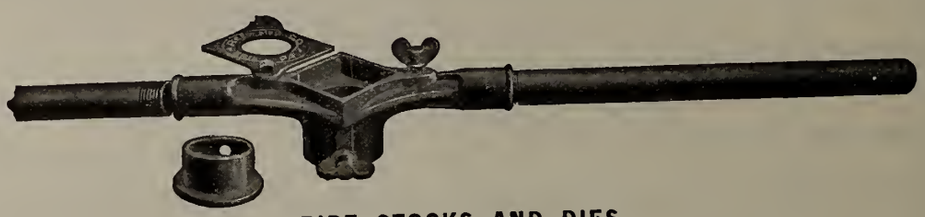

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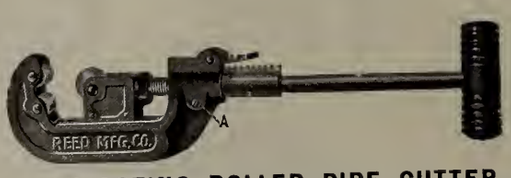

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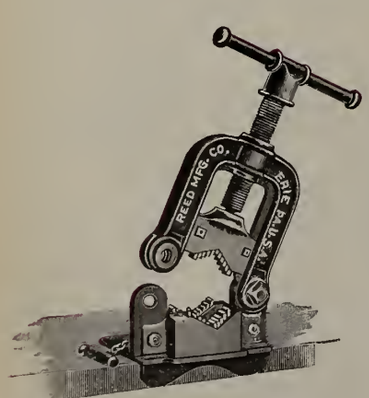

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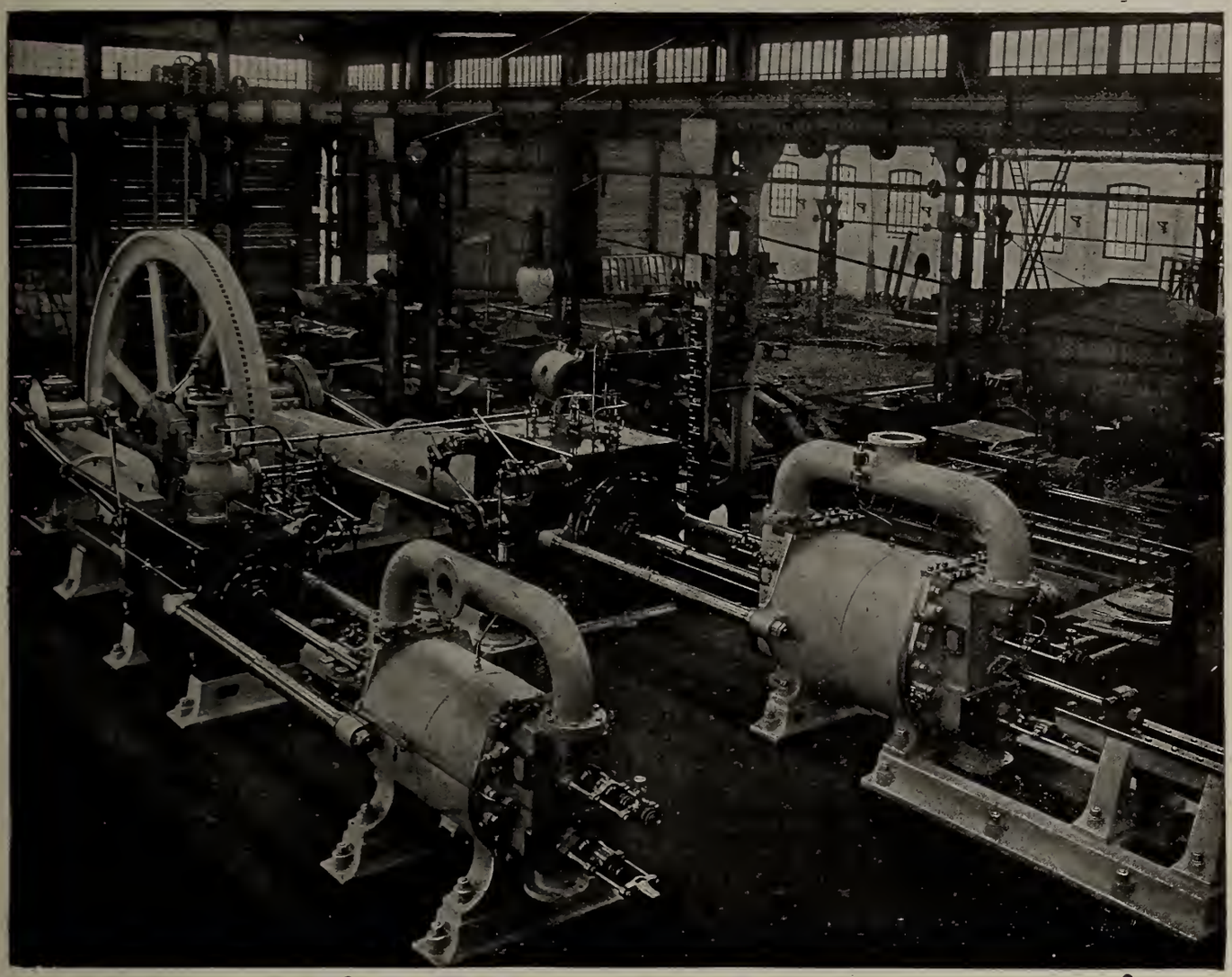

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MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN. May 10th, 1897.

DEAR SIRS,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

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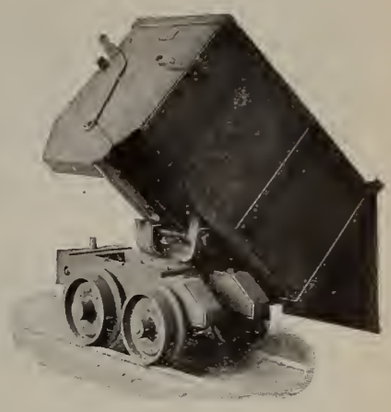

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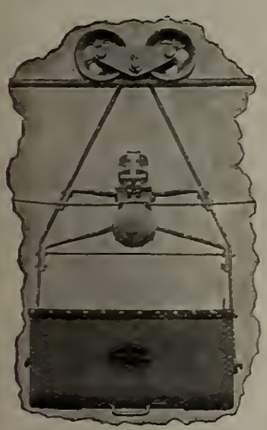

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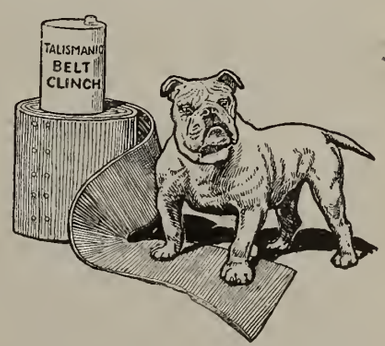

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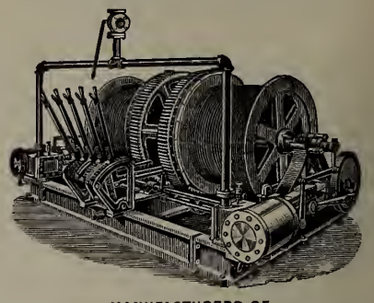

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We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

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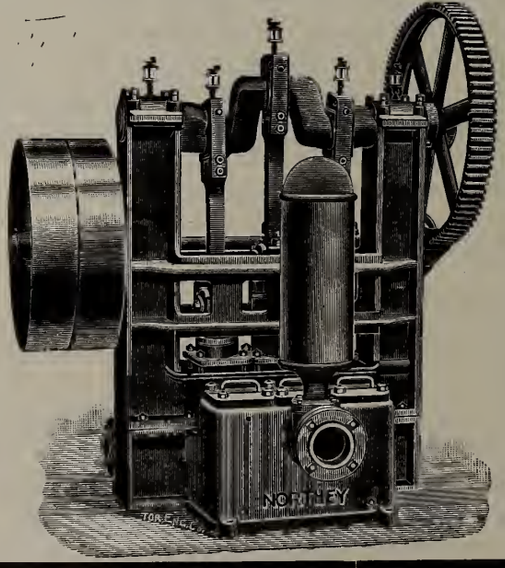

We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

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19th YEAR OF PUBLICATION.

The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

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The Nickel Question.

It will be remembered that when the "Act to amend the Mines Act" was passed in the Ontario Legislature in the spring of 1900. it was claimed that by the Hoepfner process actual refining would be in full blast at Hamilton in September, 1900. So far from this being the case, in litigation which has resulted from the operations at Hamilton an affidavit made by Mr. John Patterson has been fyled by the law firm of which the Attorney General is senior partner at Hamilton, in which, referring to the expenditures at Hamilton, Mr. Patterson says that while it is true that there has been expended upon the plant, machinery, and buildings about $150,000, the greater portion of this amount was expended at the instance of the plaintiff (Dr. Carl Hoepfner) upon machinery and plant which is worthless except as scrap. Mr. Patterson refers to the processes, and says that the processes alleged to be covered by the patents referred to are "of no commercial value."

Now that the reason for the passing of the Act by the Ontario Legislature has disappeared, the Ontario Act should be disallowed by the Dominion Government, in the interests of the mining industry.

The Ontario Government recently stated that it was not in the public interests to enforce the Act. This is undoubtedly true, but if it is not in the public interests to enforce the Act then it should not be allowed to continue upon the statute book. Although the objectionable sections have not been brought into force by Order-in-Council, they still operate as a serious menace to investment, and have already done incalculable mischief.

Another Instance.

We do not single out the Clarendon Mining Company, of Ontario (doing business in Detroit), as being in any respect peculiar in its methods of beguiling the over-credulous investor, but merely as another instance of the familiar gold brick game, as applied in the mining world. The gold brick figures as an ornament on the cover of the prospectus, purporting to be a fac-simile of one shipped by the company to the United States Mint, which shipment is to be repeated many times in the interest of the future stockholders, who are now invited to walk in on the ground floor at the rate of twenty-five cents a share. Now surely this is a most gracious courtesy to the poor public! Here is a company generously offering to share its wealth with any comer for a nominal consideration, when it has a mine with large ore reserves blocked out, showing some $40 per ton, having an idle stamp mill, all erected and ready to grind out gold bricks by the car load, and with conditions so favourable that the costs of mining and milling will not exceed $2.50 per ton! In other words, this company could, on its own showing, grind out $18,000 worth of gold brick in 30 days at a gross cost of $1125. With such an assured profit in view it could borrow $1,125 at ordinary bank rates, pay this back in one month, and have a balance of some $17,863, and yet it prefers to offer stock at a discount of 75 per cent. to obtain working capital. Such prodigal generosity and business imbecility are enough to make one rub his eyes in amazement.

The prospectus affirms that "The Clarendon has passed the experimental stage, and is in shape to show a dividend at an early date." If such be true to-day, it was also true last season, when work was stopped. The mine and mill were then working, and should, according to the figures given, have been paying a net profit of $17,863 per month, on an assumed capacity of 3 tons per stamp per diem, which is a reasonable duty with modern machinery. At this rate the company could have kept a very large force of miners busy on development work, and have laid by a sufficient sum to buy a larger mill at this time, paying cash, and gaining thereby the advantage of all the discounts which ready money will unfailingly command. If the mine could not pay expenses then, how can it expect to do so now? If it was paying, what sort of business men could its owners be to deliberately shut off their source of revenue by closing down?

For the benefit of those who may not know where this wonderful mine is situated, we will explain that it lies in the northern part of Frontenac County, Ontario, about 17 miles from the Clarendon station on the Kingston and Pembroke railroad, in a region possessing some scenic attractions made up of lakes and glaciated rocks. The property has had a more or less checkered career, under various *aliases*, the last of which, before it assumed the name of Clarendon, was the Boerth. It received its first baptism of folly at the hands of one Dr. Eames, whose "new process" monument is shown in all its grandeur in a cut entitled "Clarendon Milling Plant," in the present prospectus. Later, a modern ten-stamp mill was erected, which is a useful adjunct to any mine which can yield free-milling gold quartz. There is a conspicuous outcrop of a quartz vein on the property, which has been prospected to some extent. As to the value of this vein we know nothing. The company's secretary, who also claims to be a mining engineer, and who has also performed the functions of assayer, gives a number of results varying from $16 54 to $181.69 per ton. He records the fineness in several cases as being 980, this remarkable determination having been reached in the course of assays

on samples of ore, instead of bullion! He further states in his "report," "I have never seen such remarkable richness joined to the well-known indications of permanency, with so little development." It would be interesting to know what these indications are, especially in view of his naive confession of small development.

This doughty secretary is included in the prospectus among what are termed "the best mining engineers in the country," concerning which class much is said in terms of commendation. Alas! under what name shall the Mining Engineer take refuge in future? Once the charlatan called himself a mineralogist, then a geologist, and finally a mining expert. Now he parades as a mining engineer!

After all, we blame the pretender less than the public that will subscribe to the stock of a concern which on its very face does not set forth a plain business proposition, which stultifies itself by its own statements, which talks of ore bodies without giving a single measured quantity. Just so long as the public encourages promoters to traffic on its credulity, it can expect nothing better than to be plucked. But all this is unfortunate for those who desire to conduct mining on a proper business basis.

Still another instance of the way in which promoters of mining enterprises seek to gull the small investor is that of the Ash Rapids Company, of Minneapolis, which has been heralding its property in the Lake of the Woods district. In this case the name of a well-known mining engineer, Mr. Charles Brent, was used to inspire confidence, quoting him as commending the enterprise in the highest terms. It turns out that Mr. Brent was never retained to report on this property, and that he did not make the statements imputed to him. It is surely bad enough to defraud the gudgeons, but it is infinitely worse to try to steal the good name of a conscientious engineer. We can only ask with Mark Twain, "I wonder why some things are?"

Uniform Mining Regulations.

The March issue of *The Labour Gazette* gives a summary of the regulations in force in the various provinces of the Dominion relating to the protection of employees in mines, which shows that the Canadian legislator has been duly zealous for the safety of miners. In fact the regulations are for the most part more stringent than those obtaining in a great majority of the States of the Union, with the exception of Pennsylvania and a few other States where coal is extensively produced. It is singular that stringent legislation of this character has never been made to any extent in the great mining states of the West, Montana being the only one where this matter has received much attention. This has probably been brought about in Montana owing to the treacherous character of a number of its most important mines. It is noticeable, however, that strenuous efforts are being made in Colorado, Utah, and other States to make good their deficiencies in this respect.

Coming now to Canada, we find both British Columbia and Nova Scotia requiring alternative exits from mines, single shafts being prohibited. This is a wise requirement, and it is surprising that Ontario, which has taken a somewhat advanced position in the matter of mining regulations, has not adopted a similar rule. The regulation in the Provinces mentioned seems somewhat defective, however, in the close proximity allowed for the two shafts; the required distance apart in British Columbia being only 10 feet, and in Nova Scotia 45 feet.

In regard to the raising and lowering of men all the provinces require a properly maintained ladderway, and restrict the use of machinery for this purpose within somewhat narrow limits, especially in Ontario, where the provisions for safety are especially complete. Reduced to the fewest words these requirements admit of hoisting or lowering men only in cages or buckets, provided with protecting hoods, working on suitable guides, and only when automatic arrangements to prevent overwinding are employed, in conjunction with hoisting engines provided with double brakes. This is stringent, but reasonable.

Regulations concerning sanitation, ventilation, dressing rooms, refuges in tramroads, signalling, etc., are fairly uniform, but only one Province, Ontario, has adopted a signal code which is made obligatory. This code is the same as that used in Montana, and the extension of the use of this code throughout the Dominion would not be a bad idea. Accidents resulting from confusion of signals are very common, and it is certainly in the interest of safety that miners should find the same set of signals in use wherever they may go. The code in question is exceedingly simple and clear, and is adapted to the use of a mine from its earliest stages as a mere prospect shaft to its extension to any number of levels in depth.

The only other regulation which seems to deserve comment is that dealing with explosives. Nova Scotia and British Columbia both prohibit the storage of explosives underground under any circumstances. Ontario admits of storing a maximum of 100 lbs. of dynamite under suitable conditions on each level. Manitoba allows a quantity to be stored in the mine sufficient for a six days' supply, which is very loose. The Ontario regulation also seems to approach rather closely the danger line. In other respects the Ontario law on this point is excellent, and noteworthy for its minute details. which are merely enforcing what is recognized generally as the best practice.

There has been considerable complaint on the part of many mine managers against the stringency of these regulations, chiefly in Ontario and British Columbia. In some respects the complaints are justifiable, mainly because the regulations require more than was intended. It has been suggested that uniformity in these regulations throughout the Dominion should prove desirable from every point of view, and that if the Canadian Mining Institute, as being a body representing the best mining engineering talent of the country, were appoint a committee to investigate the matter and draw up a set of regulations for safety that would be universally applicable, the Provincial Legislatures might willingly adopt them. The idea seems worthy of consideration.

The Future for Iron and Steel.

Mr. Edward Atkinson has never, we believe, been accused of pessimism, and he now comes forward, in an article in the *Manufacturers' Record* on the outlook for Iron in the next few years, as an optimist of the most cheerful and reassuring sort. He is a bold prophet who dares to forecast the commercial future of the world for a whole decade, but Mr. Atkinson has done this before and the outcome has justified his prediction. In 1890 he affirmed that the world's production of pig iron in the year 1890 would reach 40,000,000 tons, and the estimates now show that it did reach the enormous figure of 40,500,000 tons. In the meantime one of the most serions periods of commercial depression has been passed through, which perhaps shows the wisdom of prophesying far enough ahead to cover such contingencies.

The calculation is based on normal consumption per capita, combined with normal increase in population. The consumption moreover is subject to a fairly regular rate of increase, to which of course there must be some limit, a point which Mr. Atkinson fails to discuss. In 1890 the consumption in the United States was 350 pounds per capita. At the present rate of increase it will reach 400

pounds by 1902. In Great Britain, France, Germany, and Belgium it amounts to 175 pounds, while for the rest of the world, estimating the iron consuming population at 1,200,000,000, it is only 11 pounds per capita. The consumption in the United States from 1880 to 1890 increased 10 pounds per capita per annum, so that it is evident that the increment is a decreasing one. On the other hand the rate is increasing in Russia, and in other parts of the world where rapid growth, out of what may be called pioneer conditions, is taking place. These factors, however, are neglected in Mr. Atkinson's estimate, which is made on the basis of present consumption, increased by growth of population. Accordingly Mr. Atkinson puts the probable consumption of pig iron in 1910 at 60,000,000 tons.

Concerning Canada he says: "The recent opening of vast deposits of rich steel ores in the maritime provinces of Canada close to deep water, may enable Great Britain to keep in line, but as these deposits are adjacent to abundant deposits of coking coal and limestone, perhaps British iron and steel works may have to be in part removed to this continent in order to continue." Viewing the situation on the North American continent more broadly he affirms that "the United States must supply the greater part of this increase (in the world's output), and if common sense prevails, leading to the enactment of a reciprocity treaty with Canada, or yet more, if all duties are presently removed from the import of ores from Cuba and Canada and of old scrap iron and steel from all parts of the world, the iron and steel industries of the Atlantic coast will soon be unable to supply the export demand, and the iron furnaces and steel plants in the interior will soon be unable to supply the domestic demand."

Mr. Atkinson takes an equally cheerful view of the trust problem as it affects the iron trade, declaring that "no combination can corner the steel of the world, however powerful." This, we aver, remains to be seen.

Mr. J. Stephen Jeans, of the London Iron and Coal Trades Review, reaches very different conclusions concerning the case. Pointing out that the present high production denotes a natural result of phenomenally good times, beginning in 1897, and that the capacity to produce has been increased during the last four years at a rate out of all proportion to any normal increase in consumption extending over a considerable period of time, he anticipates speedy over production, and consequent changes in the aspect of the iron and steel market. He objects to taking the rate of increase of consumption as indicated by output during periods of boom, but assumes as a safer basis of calculation the normal increase during periods of depression. There is a good deal in the difference of one's point of view. Mr. Jeans would look ahead in the light of the conditions obtaining from 1889-96 when the total increase of pig iron production throughout the world only amounted to 3,500,000 tons, or little more than half the increase that is being provided for by the furnaces building or rebuilding at the present moment. We incline to Mr. Atkinson's reasoning, as being unassailable in regard to normal rates of increase, with this difference that the total production through any given period, say a decade, should be taken as the ground on which to arrive at the true increase. The point is that the consumption is not likely to be steady at the rate Mr. Atkinson assumed through the coming decade, and productive capacity, taxed at intervals to keep pace with the demand, will be excessive during a portion of the time.

President Libbey of the Mining Society of Nova Scotia is to be congratulated on his out-spoken condemnation of fake mining industries down by the sea.

Dawson & Selwyn Memorial Portraits.

In recognition of the invaluable services rendered towards the development of the mineral wealth of Canada by the late Dr. George M. Dawson and his predecessor, Dr. A. R. C. Selwyn, late Directors of the Geological and Natural History Survey of Canada, the Canadian Mining Institute invites subscriptions from the Canadian mining public towards its fund, for the purpose of presenting suitable portrait paintings of the late Directors to the Museum of the Survey with which their life work has been so prominently identified. Remittances marked "Dawson and Selwyn Memorial Portraits" should be sent to the Treasurer of the Canadian Mining Institute, Mr. J. Stevenson Brown, Temple Building Montreal, or to the undersigned. All subscriptions will be acknowledged in these columns. The following amounts have been subscribed to date:—

B. T. A. BELL,
Secretary.

Canadian Mining Institute	$100.00
Officers of the Geological Survey	54.00
Hon. Sydney Fisher, M.P., Ottawa	25.00
London & B. C. Gold Fields, Ltd, Nelson, B.C.	25.00
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Rinaldo McConnell, Ottawa	5.00
Dr. F. D. Adams, Montreal	5.00

Encouraging Good Roads.

A novel and practical plan has recently been adopted by the Illinois Central Railroad, which must have important results in increasing at one and the same time the industrial prosperity of the communities tributary to this line, and the carrying trade of the railroad itself. A so called "good roads train" is to be started from New Orleans, and to work its way gradually from point to point to Chicago. The equipment of this train will consist of the following: One car carrying a stationary engine, rock crusher, elevator, and screen; one car carrying a road roller, road machine, plows, and scrapers; two gondolas for transferring stone, sewer pipe, etc.; one car for coal, and carrying a water tank; one business car, with commissary to supply two government engineers, one representative of the National Good Roads Association, and two skilled operators for the machinery; and one road department boarding car, with six laborers.

The purpose of the "good roads train" is to give practical illustration of the best means for making a passable highway, with the materials available on the spot. At each point a roadway will be built for a distance of from a half of a mile to one mile from the railroad station. Co-operation on the part of the inhabitants of the district will be sought. Interest in the work will be promoted through the action of local boards of trade and other commercial organizations, and conventions will be called through these associations to discuss the good roads movement at each place where a sample road will be constructed.

This opens up a whole new field of endeavor for railroad companies, for the same idea could be carried farther than in the building of highways. Even within these limits, every trunk line might create

an interest in facilitating less expensive transportation from the surrounding country to its stations. A good beginning might be made in building good roads in the immediate vicinity of the stations, where the conditions are often worse than on the highways themselves. This movement is of value not only to the farming class, but would soon show its effect on many branches of the mineral industry, such as quarrying, brick and tile making, lime production, gypsum, etc. There are many places in Canada where such industries would arise but for the condition of the roads, which limit hauling to the season when "sleighing" is possible. Here is an opportunity for the Canadian Pacific and Grand Trunk Railways.

Algoma Mining Freaks.

I was engaged as assayer, some years ago, by a Canadian Company who were operating on the North Shore of Lake Superior. The Manager, a school teacher of years and experience, was driving a tunnel into a granite hill. The tunnel was lower at the breast than at the mouth, and as one shift only was worked there was an accumulation of several feet of water during the night. I have a very vivid remembrance of all hands and the cook packing water out of that tunnel every morning. I ventured to suggest a hand pump. The Manager looked at me askance as if he thought I was infringing on his prerogative and making myself officious. After a lapse of several days Mr. Manager announced that he had sent for a pump and that it would arrive at the station that evening. I was ordered to go after it, and on asking for some men to help me carry it to the boat was informed that I could carry it myself. I went off, full of anticipation, which was more than satisfied when I saw the pump. It was a good sized syringe, intended for spraying fruit trees or bailing out a boat The comments of the "Cousin Jacks" when I appeared at the mine with the pump over my shoulder it would not be proper to reproduce in this paper. I may state that the Company spent $25,000, have two tunnels aggregating 180 feet in length, shipped the whole of the high grade ore to the home office in two cigar boxes, attempted to ship several tons of lower grade in an ancient barge, caulked with rags and blue clay, which promptly went to the bottom in spite of the heroic efforts of the "Cousin Jacks," who swam ashore. "A complete assay outfit" had been purchased, according to the prospectus of the Company. I found this to consist of two plumbago crucibles, one muffle, Battersea, size F, a pair of apothecaries' pocket scales with pans of horn and string suspension, and a set of apothecaries' weights. This Company "went broke," and you couldn't get a cent for mining in Algoma from any of them or any of their friends or associates. They say the country is no good. Do you wonder?

Some years later I was assayer at one of the noted silver mines of Algoma. There was in the mill yard a unique collection of rusty scrap-iron, the cast-off devices for silver extraction thrown aside during the evolution of the mill. This mill was a law unto itself; the processes of natural selection and survival of the fittest were allowed to go on by the manager in all their native beauty, untrammeled by any of the lessons of experience. The result was a machinery museum in which one could see something new every day, driven by a fire-eater of an engine that achieved the distinction of clearing more land than anything of the h.p. ever invented before. I remember on one occasion remonstrating with the new mill superintendent, a supposed "cracker jack" from Colorado, when the tailings soared ounces above the headings, he called me on one side and informed me that he had never seen a silver mill before. I admired his candor, aud as he was a decent fellow, the extraction as returned to the office was not so bad as it might have been. This mine extracted half a million ounces in five years and finished up "in the hole." I heard one of the stock holders of this mine, only the other day, strongly advising one of his friends not to put any money into Algoma mines. Do you wonder? While employed at this mine I used to wander once in a while to a neighbouring mine that was noted for the number of "nuggets" of Argentite or "black silver" found in the veins (I saw one mass of 40 lbs). I sauntered into the blacksmith shop one day, and saw the manager preparing to melt some "nuggets" in a babbit ladle. I was immediately interested. The ladle was well filled with several pounds of argentite, the helper blew the fire lustily, the mass started to melt, and—there was no bottom in the ladle, and the forge became, for a foot or two in depth, highly argentiferous. There was some profanity, but after things had cooled off a little I suggested trying the experiment in a black lead crucible, mixing the remainder of the argentite, which was mostly dust and small fragments, with some charcoal and nitre. It was a big thick pot, and nothing happened at first, but as soon as it got warm I saw something attractive outside. There was a sharp report a moment later, my very fair substitute for gunpowder had gone off, the blacksmith and his helper were full of coke and plumbago, and the manager was in the blacksmith's tempering tub, digesting his second lesson in the metallurgy of silver. This mine put up a "saw mill" for a stamp mill, extracted 350,000 ounces in two years, and ended up in the hole, leaving the working men with six months' arrears of wages. Why?

Not many years ago I was engaged to superintend a new gold mill in Algoma. This mill, a few weeks previous to my engagement, was reported on, for a consideration, by one of the best known *military* metallurgists of the district, and pronounced a first-class plant for the extraction of gold and silver values from the ores of the country. The stock holders were much elated, and looked forward with fond anticipation to the 50 per cent. dividends promised them by the promoters of the scheme. Let me describe briefly my first visit. It was a cold winter's day, the building was built of rough lumber covered with corrugated iron, the heating arrangement an occasional whiff of warm air from the boiler room, the temperature a little above freezing. There were two crushers, each of unknown species; one was running merrily and was being "fed with a spoon." The other was idle and carried on its pitman a block of ice as much as a man could lift. The place was full of dust, but as I wanted to get an insight into the ice business I waited. In a few moments the crusher man felt the bearings of his busy machine, hastily threw off the belt, changed the block of ice from No. 1 to No. 2, started up No. 1, and all went merry as a marriage bell, until the next time. The ore, after being crushed, was elevated 40 feet and then allowed to run back to the floor on which the crushers were situated, whence it was fed by hand to a pair of pulverizers which were doing their best to grind themselves to pieces on the exceedingly hard quartz with which they were being fed. The machines were, without exception, the best contrivances for grinding iron by means of quartz I have ever seen. When I tell you that the normal wear was between three and four pounds per ton of quartz you will see that I am not exaggerating. The pulverizers were wet grinders, and the pulp, on issuing from the screens, passed over a series of cast iron riffles set in a sheet iron trough. All the gold saved in the mill was caught in the first two feet of these riffles, and more than 50 per cent of the values were allowed to escape. The tailings ran into four large grinding pans, followed by two agitators and a pair of eight foot settlers. All of these were whirling around without a pound of mercury in them, doing no work, their uses unknown to anyone in the mill, driven by a huge fire-eater of an engine using seven cords of wood per 24 hours. The average

crushing was 5 tons per day. A large reverberatory, the roof of which fell in the first time it was fired, and a colossal retort, capable of handling all the amalgam in Canada, were prominent features of this unique plant, which, after various vicissitudes, stands idle to-day, a monument to the gullibility of the public and the success of a pair of unscrupulous fakirs.

The crying need of this section of the country is a school of mines that will turn out trained men who will not need to complete their education at the expense of their employers. We have a country of marvellous resources, the development of which is being severely retarded by the gross incompetence and fakirism of the men who have been in charge of many of our mining ventures. The public need to be educated to the fact that miners and metallurgists are not born, but made, and that it is unsafe to entrust the management of a mine to a man who often possesses no other qualification than a relationship to some of the directors

Would a trained man drive a tunnel 400 feet into a hillside to attain a depth of 30 feet, or, having a good natural slope for a mill site, deliberately dig a cellar and put his mill into it endwise? Would a sensible man sink a prospecting shaft 12 feet by 16 feet, or put up a mill on the top of a hill where there never is any water except when it rains, or place it in a swamp so low that the tailings flood the wheelpit of his engine three weeks after starting? Would any man possessing ordinary common-sense spend thousands of dollars sinking shafts on the indications of a divining rod, or build a first-class stamp mill and three miles of railroad without one foot of development on the mine? What would you think of an assayer who makes "Fire" assays, "fires the samples out of the window," and coolly writes out his certificate of assay, or who finds gold values in brick-dust, rock-salt, blue clay, or "any old thing"? A good many thousands of dollars were spent recently in our country on extensive borings in blue clay at the bottom of a lake, all on the strength of results of "Fake" assays. What do you think of a mining engineer, who on the strength of a couple of examinations condemns a whole district and says it is no good? A mining engineer possessed of common sense, divides the properties in any country into two classes, those he has examined and those he has not examined. If he has examined a property, his examination and report is the property of someone who has paid him for his work, and he has no right to open his mouth about the matter. If he has not examined a property he knows nothing about it and can say nothing. A man came into my office some time ago with a new cyanide process. He proposed to boil the crushed rock with cyanide and some special dope he had invented. He wanted to have the use of my laboratory for his experiments. I recommended him to experiment in a kitchen, and advised him to boil his rock with red cabbage before treating with cyanide. I told him I thought he would get a better extraction. He thanked me, but would not speak to me next day. I have before me an adver isement of an Algoma mine, which states that a shaft 100 feet deep with a cross-cut 100 feet long at the bottom exposes 1,500,000 tons of ore! I should think it exposed the ignorance of the writer. Another concern professes to have a shaft 300 feet deep, and in their advertisement say "Remember we have ore enough to keep fifty 40-stamp mills pounding out gold continuously, not only during the lifetime of our youngest stockholder, but during the lifetime of his childrens' children." This is equal to the speech made by another of our managers to his stockholders in London. He mentions nothing less than 30dwt. ore, but admits that some runs 12½ozs. He is glad that a new issue of stock is being made, so that he and his assistants may have a chance of investing and of "Putting up our hard sovereigns with yours," as he enthusiastically threatens to do. I hope that other sanguiue gentlemen may have better luck than this last one, who shut down his mine a couple of months after making his bluff.

In concluding this paper, which is made up mostly of chaff, but which may afford some kernels of truth on reading between the lines, I desire to protest against the dishonesty and incompetence that have been the cause of so many failures in mining in our country. There is enough natural risk in mining to satisfy the ordinary desire of the votaries of chance, and we must eliminate the ignorance and charlatanry too common in this country before we can hope to place mining on the business basis it should occupy.

Rat Portage. CHARLES BRENT.

The Kingston School of Mining.

By COURTENAY DE KALB, KINGSTON, ONT.

In view of the important improvements which have been made in the equipment of the Kingston School of Mining during the past year, and of the extensive additions which are to be made to its facilities before the opening of the session of 1901-02, it seems fitting to make more widely known the advantages which this institution is able to offer in the education of engineers. While primarily a mining school, it has developed courses leading to the degree of B. S. in other branches of engineering, which will in future be given greater prominence, since the new buildings and their equipment will admit of adequate training in mechanical and electrical engineering, chemistry, and geology. Considerable stress has been laid on these two latter courses in the past, but the mechanical and electrical departments have not hitherto been so well sustained on the side of laboratory instruction for want of space and suitable apparatus. This deficiency will now be made good.

A laboratory for the department of mining and metallurgy was erected a number of years ago, and was fairly well equipped. But within the past year this building has been enlarged to three times its original size, and the milling plant has been completely remodelled, receiving additions of machinery which make it one of the best of its kind in North America. It is important to observe, furthermore, that all the appliances for ore treatment are of sizes recognized as standard in practical work. No laboratory models are employed in this department. The usage in technical schools varies greatly in this respect. Some, following the example of the Massachusetts Institute of Technology, employ machines of small size, whose avowed purpose is to illustrate principles only. Others combine models with some appliances of full working size. Very few have adopted the policy pursued at Kingston of using only standard sizes throughout. It is true that a student can not be given a training which will be the equivalent of practical experience by even the best ordered laboratory instruction, but so far as this instruction goes it should yield results which will give a correct idea of what might be obtained on a commercial scale. Wrong impressions obtained in laboratory work are difficult to overcome later on, and toy machines certainly do produce erroneous conceptions because they seldom can be made to perform a duty which is the equivalent, even in character, of that yielded by machinery where proper proportions exist.

For example, a small stamp mill never will give results which can be duplicated on a large scale. The proper relations between weight of stamps, size of mortar, height of discharge, quantity of water, etc., are of vital consequence, and such relations are impossible to establish in a 3 stamp mill with light stamps, such as are commonly used in milling laboratories. Recognizing these facts, the School of Mining has adopted the policy of using standard equipment for practical instruction in milling methods. Small lecture room table models are

used to some extent, however, to illustrate principles, these being intended to represent concentration of ores under more nearly ideal conditions than are attainable by practical working machines.

The completeness of the equipment of the milling laboratoty will appear from the following list of appliances now installed: One 7 in. x 12 in. Blake Crusher, one pair of 12 in. x 7 in. rolls, one No. O. Krupp ball mill, one 12 inch cone grinder, one 5 stamp mill, with 850 lbs. stamps, one Frenier spiral sand pump for elevating sands, one No. 2 Heald and Sisco centrifugal pump connected to an agitator tank, one 17 ft. Wilfley concentrator, one 4 ft. x 12 ft. Frue vanner, one 3 compartment Hartz jig, one 2 compartment Evans jig, one 16 ft. revolving buddle. 4 different types of hydraulic classifiers, one 3 compartment spitz kasten, one Wetherill Magnetic separator, one 10 inch centrifugal machine for slime treatment in cyaniding gold ores, one Johnson filter press for the same purpose, a cyanide leaching plant to treat 1,000 lbs. at a charge, a barrel chlorination plant for gold ores capable of treating 500 lbs. of ore, with a reverberatory furnace for roasting the ore, an automatic sampler, and a chemical laboratory for determining the results obtained in milling. There are also various types of rock drills, air compressor, etc.

It should be stated also that the School of Mining, as an encouragement to the adoption of suitable methods in ore treatment, will make tests for process in its milling plant for any parties in Canada at costs intended merely to cover the actual outlay incurred in crushing and treating the ore. In cases where the material may prove suitable for laboratory instruction the School will take its pay for such services in ore instead of money.

The Duty of Stamp Mills in Crushing and Amalgamation.

By Courtenay De Kalb, M.E., Kingston, Ont.

[Paper read before the March meetings of the Canadian Mining Institute.]

It is with reluctance that I venture to speak upon this important subject, for which I am not aware of possessing any special fitness. I enter the field only upon the solicitation of our Secretary, in the hope that I may stimulate others to offer the fruits of their experience in discussion. I have used the stamp mill on a large variety of ores, crushing for amalgamation, for amalgamation and concentration, and for cyaniding without amalgamation. The latter I have come to regard as ordinarily of very doubtful expediency, to say the least, for I do not think anyone will maintain that the stamp mill is an economical crushing device. There may be exceptions to this, however. For example, sectional machinery for crushing is not usually satisfactory. This applies to rolls, Huntington mills, and other roller mills, of large capacity. The smaller sizes are less difficult to keep in repair, but their consumption of power is large in proportion to the work done. Sectional stamp-mills, on the other hand, are eminently successful, accordingly they would be justifiable for crushing for cyaniding in a remote district where heavy pieces of machinery could not be transported. Again, crushing in rolls is most efficiently done on dry ores, unless the ores are singularly free from aluminous or sericitic matter. If the ores were very wet it might prove too expensive to dry them. It rarely pays to dry ores when extra fuel must be burnt for that purpose. If it cannot be done by waste gases from the boilers, then it will in all probability have to be abandoned. Here, then, is an argument for using the stamp-mill merely as a crusher. In passing I may add that crushing finer than one millimetre (about No. 16 mesh) in rolls is not economically possible. Hence, in crushing for cyaniding, the crushed product must be sorted in hydraulic classifiers, the first spigot discharge being then reground in some other type of mill. For this purpose I have found either the Huntington or the ball mill suitable.

The tendency of the stamp mill is to make an excessive quantity of fines. Under ordinary working conditions the percentage of the total ore fed which will be crushed finer than No. 100 mesh will vary between 28 per cent and 40 per cent. I have found about 32 per cent to be near the average. All that prevents the production of a larger proportion of fines is the masking of the blow upon the smaller particles by the crushing of the larger particles on the die. I am inclined to believe that very nearly all the fines are produced in the crushing of the larger particles, those which rest upon the die and protrude above the general mass of ore upon it, especially where low discharge is employed. It may not be commonly known that the crushing in a stamp-mill is accomplished mainly by the reaction from the die after the stamp has fallen. If a stamp is allowed to fall upon a single lump of ore resting upon the die it will be found that the upper portion of the lump will have been merely fractured, while a considerable proportion of the lump adjacent to the die will have been reduced to powder. The force of the blow has developed spherical waves in the ore particle, which traverse it until they meet with resistance from the die. They are then reflected backward, meeting succeeding on-coming waves, the result of which is to overcome the cohesion of the mass, comminuting the lower portion of the lump. Further experimentation will be necessary to determine the other conditions under which crushing is accomplished in the stamp-mill, but the statement I have made has, at least, been demonstrated by careful tests in the laboratory of the School of Mining. So far as it goes it leads to two conclusions regarding crushing for high capacity, viz., the feed should be kept thin, and the crushed material should be hurried out of the mortar as rapidly as possible. This is only affirming on theoretic grounds what has long been practically recognized and applied in California, and in other places where high amalgamating capacity and high crushing capacity were compatible. Nevertheless, there is a tendency even in California to overfeed the battery in a desire to put through a large amount of ore, and I think that this error on the part of millmen is too general everywhere. To be sure, it is an economic question, to be determined independently in every mill, but it is very easy to err on the side of high capacity at the cost of reduced inside amalgamation. Mr. Dana Harmon, in a very suggestive paper on the Stamp Milling of Free Gold Ores, read before the Technical Society of the Pacific Coast (Sept. 7, 1900), affirms that if the ore is one that will yield its values in amalgamation, at least 60 per cent. of the gold should be caught in the mortar. This would not be altogether an unsafe rule for the millman, though I should modify it so far as to claim that 60 per cent. of the amalgamable gold should not be allowed to escape through the screen.

I have observed a marked tendency to discard inside copper plates in the West, and many of the best superintendents no longer attempt to use plates on the chuck blocks. When a low discharge is used the scour is undoubtedly excessive, and any amalgam that may have formed on them is necessarily washed out with the pulp, which is difficult to save. Fine particles of amalgam will escape from the ordinary mercury traps, and while outside plates will catch fine gold they accomplish very little, if anything, in arresting amalgam that may have issued from the mortar. I have used with success in narrow mortars, back plates with protecting cast iron shields so placed as to leave a space about one-eighth of an inch wide between the copper plate and the shield on the upper edge, and one-quarter of an inch wide on the lower edge. The pulp washes up between the two plates and over the shield, and on the return flow a portion of that which washed over the shield also passes between the shield and the copper plate.

Amalgamation is thus facilitated, and scour is prevented. In setting back plates, they should always be placed so that the upper edge of the plate is higher than the normal rise of the pulp wave, and my experience has been that the greater amount of amalgam will be found in a band approximately coinciding with the upper limit of the rise of the wave. It is merely a question of time of contact, admitting of union between the gold and the mercury. For the same reason I prefer multiple apron plates, each plate not more than 2 ft. long, and successively overlapping each other, so that the pulp in falling from one to the other may have a better opportunity for prolonged contact, with the mercury under each recess thus formed. Time is all important in amalgamation, and many millmen do not provide the proper conditions in this respect for perfect extraction of the gold. A very common fault is that of using too much water, so that the pulp is swept too rapidly over the apron plates. As thin a stream of pulp should be obtained as will flow smoothly and freely over the plate, maintaining the crescent wave which is one of the indications of proper distribution of the pulp. Every effort should be made to save the gold by amalgamation, and no reliance should be placed upon the concentrators for this purpose. If any amalgamable gold large enough to be caught in the mortars and on the plates is saved on the concentrators, it is a sure indication that the milling conditions need modification.

I wish to insist upon the importance of a careful study of the pulp, which should be made with every ore, and at intervals of a few months with the same ore, unless the tailings assays show that the best possible results are being constantly obtained. For this purpose, after a "clean-up," before adding any mercury, ore should be crushed in an ore battery until normal conditions are established, taking care to feed a good average of the regular ore milled, and then the whole pulp stream should be saved until several barrels are filled. Allow this sample to settle, siphon off the clear water, and dry the residue. Weigh, and screen through a series of sieves beginning with a size slightly larger than that of the rated size of mesh in the battery screen, and carried down as fine as No. 150 mesh, or even to No. 200 mesh. Weigh these several products and calculate to percentages for plotting a sizing curve, which will show graphically just what quality of crushing your mill is doing. Divide each one of these products into two portions, mixing as for sampling and combining opposite quarters, and assay one of these portions corresponding to each size of screen mesh. The other portions should be tested as to the amount of amalgamable gold they contain by pan amalgamation, and the residues then concentrated on a vanning plaque. After assaying all products the results can also be plotted for convenience. when, if the experimenter were careful, the whole story should appear. Comparative tests or this sort, made upon pulp obtained after varying the milling conditions, will readily show the way to secure the most perfect work possible in both amalgamation and concentration. In no other way may one so speedily and surely determine what adjustments to make as regards height of drop and discharge, size of screen, and quantity of water needed, and an effort to reach the same end by merely varying the milling conditions and assaying the tailings will take a longer time, involve losses that need not have occurred, and finally yield only an appoximation to the accuracy which may be reached by such a searching investigation as that outlined above.

The question of fine breaking of the ore before feeding to the stamp mill has received so much attention in late years that some mention must be made of this innovation. Like most good things, it has been abused by unthinking men, whose aim has been to cheaply crush a large amount of ore. When the gold in the ore exists in the free slate, by which I mean that it is not locked mechanically or otherwise in the sulphides, and when the amount of coarse gold is large, there is no doubt that the results are highly economical. Since the stamp mill is not an economical crusher, the less work of this sort that we exact of it, while securing the best possible results in amalgamation, the better. Furthermore, the coarser the material fed the less duty is the mill performing, and also the splash is affected to some extent, which has a direct influence upon amalgamation. The main question is that of time for complete amalgamation. The finer the ore fed the more rapidly will it pass through the mortar. This may be corrected by increasing the height of discharge, or by using roomier mortars. The economic gain in crushing is then lost, however, and the only benefit, if there be any, is to be looked for in superior amalgamation due to more prolonged retention of ore in a finer state of sub-division in the mortar.

The weight and speed of stamps is a point regarding which there is little agreement in opinions. So far as crushing efficiency is concerned there is little difference between the two, within the limits of weights which may be regarded as standard today, viz, 850 lbs. and 1100 lbs.; that is to say, the difference in speed bringing the output per horse-power expended to practically the same point. So far as I have observed the choice depends upon the character of the ore, the lighter stamp producing enough less violent splash to facilitate the amalgamation in the mortar of more fine gold, when the height of discharge in the two cases remains the same. A very slight modification in the height of discharge, however, will give to the heavier stamp the same advantage. Any material difference between light and heavy stamps is to be looked for in the wear and tear of the mill, the abrasion of shoes and dies per unit of ore crushed, and the relative weights of metal thrown on the scrap heap in the form of worn out shoes and dies. On this important point I have no certain data on which to base conclusions. The experience of millmen with regard to this would be of great value.

I wish to commend Mr. Harmon for his protest against the use of potassium cyanide solution for brushing and brightening the plates. Prudently used it may do no harm, but I have known many mills in which important losses of amalgam undoubtedly occurred from the too frequent application of this chemical. A solution of caustic soda, or lye from the leaching of wood ashes, will cleanse plates perfectly; they are not solvents for gold, and incidentally they are free from the poisonous quality of KCN.

In this brief, sketchy paper, I have not attempted to do more than throw out a few suggestions on important points, merely as a basis for discussion, without any pretence of adding new knowledge, and certainly I shall not attempt to lay down any rules concerning the duty of stamp mills. This matter is relative, dependent upon so many varying circumstances, that the only guide for the millman is to study his pulp often and critically, so that he may know, and not guess, when he has obtained the combination of highest crushing capacity with the highest amalgamable capacity, adjusted to the line of the highest economical results. It is not easy to do this, not nearly so easy as most men may think, and a man must possess the peculiar qualities of the experimenter—in other words he must know something of scientific methods of analysis—in order to be sure that he has attained the result at which he is aiming.

Resignation of Mr. Donkin.—Mr. Hiram Donkin, C. E., for many years resident manager of the Dominion Coal Company Syndicate, has resigned, and Mr. Christopher Shields, of Bristol, Va., general manager of the Virginia Coal and Iron Company, has been appointed to succeed him.

Notes on the Oregon Nickel Prospects.

By Dr A. R. Ledoux, New York.

[Paper read at the Meetings of the Canadian Mining Institute, March 7th.]

Nickel, like tin, is a metal found everywhere in the United States, but mined nowhere in any quantity to-day. It is associated with chrome-iron ores in many of the northern States; with sulphides in Connecticut, New York, New Jersey, and notably in the formerly prosperous mines of Lancaster Gap, Pennsylvania.

For years nearly all the nickel produced at this latter mine was bought by the United States Government for coinage purposes, but to Mr. Joseph Wharton we owe the demonstration of how large a number of useful articles can be made from the pure, unalloyed nickel. The commencement of the age of manufactured nickel dates from Mr. Wharton's exhibit at the World's Fair in Vienna in 1873.

Since the practical exhaustion of the ores of Pennsylvania, and the discovery of the great beds of Sudbury, the United States has been relying on the Canadian product for its nickel. In the beginning the copper nickel mattes of Sudbury were sold to different buyers, principally in Europe. The owners in the meanwhile expended very large sums of money to discover a process commercially efficient by which the mattes could be refined and the nickel separated either in Canada or elsewhere on this continent. It was not until the successful experiments of Col. Robert M. Thompson, of the Orford Copper Company, that the Canadian nickel found a ready market throughout the world in competition with the powerful nickel syndicate controlling the principal mines of New Caledonia. I observe in the statistics published by the Canadian Mining Review, in March, 1901, that Canada or New Caledonia each produced approximately 3,700 metric tons of nickel in the year 1900.

The pyrrhotites of Sudbury have been well described by members of the Canadian Mining Institute, but it has occurred to me that it would be interesting for you to hear something of the Oregon deposits, about which much was written from the political and speculative standpoints a few years since:

These deposits occur upon what is known as Big Piney Mountain, situated near the Southern Pacific Railway in Douglas County, Oregon, some 235 miles south of Portland. The nearest town is Riddles, consisting of some 50 to 100 buildings with stores, hotel, etc., lying in a beautiful green valley everywhere fertile and blest with the moist temperate climate of the Northern Pacific Coast States,—living being very cheap. During the greater part of the year considerable rain falls, but snow does not lie for any length of time excepting upon the summits of the mountains.

The range to which Big Piney Mountain belongs is an isolated cordillera, lying between the Cascade Mountains on the east and the Coast Range on the west. This particular hill rises sharply to the west of the Railroad at Riddles, attaining an elevation of some 3,600 feet above the sea. The nickel ore occurs near the summit of the hill, and for some 2,500 feet below the summit forming a mantle which covers the southerly and easterly slopes. The foot-hills are largely wooded with pine, cedar, and fir. In the valleys are oaks, ash, maple, etc. The ownership of the numerous claims which have been located, is divided between two corporations, neither of them operating at the time of my visit in 1900.

It is well known that there are three principal types of nickel ores. The sulphides have already been mentioned. There are Arsenides, such as are found in considerable quantities in Nevada and elsewhere, but from the silicates which occur in New Caledonia half the nickel of the world is produced.

The ores of Oregon belong to the same type, and in appearance and occurrence resemble closely the New Caledonian. The comparative composition of the Oregon and New Caledonian Ores is shown in Dana's Mineralogy as follows:—

	SiO_2	NiO	NgO	H_2O	Al_2O_3, Fe_2O_3
New Caledonia..	37.78 p.c.	33.91 p.c.	10.66 p.c.	15.83 p.c.	1.57 p.c.
" " ..	35.45 p.c.	45.15 p.c.	2 47 p.c.	15.55 p.c.	0.50 p.c.
Oregon	40 55 p.c.	29.66 p c.	21.70 p.c.	7.00 p.c.	1.33 p.c.
"	44.73 p.c.	27.57 p.c.	10.56 p.c.	15.86 p.c.	1.18 p.c.

The Geological relations of these deposits to the country rock is thoroughly demonstrated by the amount and character of work which has been done in the vicinity, and may be outlined, untechnically, as follows:—

Overlying the granites and the older limestones and other stratified rocks are beds of coarse igneous breccia, not only the cementing mass but its ingredients being of igneous origin. Up through and overflowing these conglomerates has been an eruption of peridotyte. This rock contains as its universal constituent the mineral olivine, which has nickel for one of its components. It is probable that the whole mountain mass of Old Piney, at least on the southern and eastern sides would average 0.25 per cent. of nickel. The abundance of rainfall and other oxydizing influences have thoroughly altered the surface of this peridotyte, not only by oxidation but by replacement until an area of several square miles has become covered by a layer varying from a few inches to twenty feet, and probably averaging ten feet thick, of what might be called a gossan of porous, soft serpentine, full of cavities and looking not unlike a coarse coral. The sepentine matrix often shades off into silica, occurring in bands and veinlets, frequently appearing as Chalcedony. Cavities in this porous rock and some of the veinlets have become filled in part with chrome-iron ore, iron oxides and the nickel silicate. After the rock has dried, the iron oxides and nickel compounds are readily shaken out as dust if two pieces of ore are struck together, or if the mass is struck by a hammer, or shattered by a blast.

It is obvious at a glance that the nickel in the peridotyte has been concentrated in the process of alteration, which alteration, as stated, may extend from a few inches to twenty feet in depth. It is interesting to know that there is still going on a concentration or segregation of nickel in dumps which were formed a few years ago, during the progress of prospecting. On digging through one of those I found a distinctly banded structure to the dump and a stratum of excellent ore in a band three inches thick, lying immediately upon an impervious bed of iron clay which had also been leached out of the ore above, thus forming an impervious bed upon which the nickel ore rested.

As to the extent of the deposit, it would be very conservative to consider it to be a layer of ten feet thick, and covering a square mile. It is one of the few places where both development and outgrowth justify the promoter's pet phrase of "millions of tons in sight." The development has been abandoned. There are probably one hundred openings, either tunnels, pits, or shafts scattered over the entire area of nickel-bearing ground. These openings have not shown a thickness of over twenty feet at any point, and in every case, whether by vertical sinking or tunnelling, the cap of enriched ore is soon penetrated, soon yielding to the low grade peridotyte. The line of demarcation is usually sharp and well defined.

With a view of ascertaining the average grade, I took a large number of samples, carrying them on horse-back to head-quarters and breaking them down at my leisure. As my visit was for private interests, I do not feel at liberty to give definite figures; certainly not to mention the names of any particular claims examined, but reference to my assay book shows nickel determinations on samples varying from 1.23 per cent. of the metal to 9 per cent.,—the great mass of the mountain being low grade. Most of the better class of ore has been shipped to New York, running about 7½ per cent. of nickel. The most extensive working is known as Oregon Tunnel. This enters the steep hill side, passing through some twenty feet of ore, then suddenly entering the unaltered rock. For 250 feet this hard rock shows seams and crevices filled with green streaks carrying little nickel, and then

These Photos give some idea of the quantities of British Columbia Silver-Lead Ore at present awaiting a markct

Silver-Lead Ore stacked at Kaslo Sampling Works.

Surface Plant—B. C. Chartered Co., Eholt, B.C.

Station at 3rd Level--B. C. Mines, at Eholt Summit Camp, British Columbia.

Open-cast working at Victoria No. II., Lot 11, Con. 4, Township of Denison, being worked by Mond Nickel Co.

New Works of the Mond Nickel Company near Whitefish, Ontario.

No. 2 Shaft-house and Rock-house—Mond Nickel Company at Whitefish, Ontario.

Boiler and Engine-house and Terminal of Aerial Tramway—Mond Nickel Company, Whitefish, Ont.

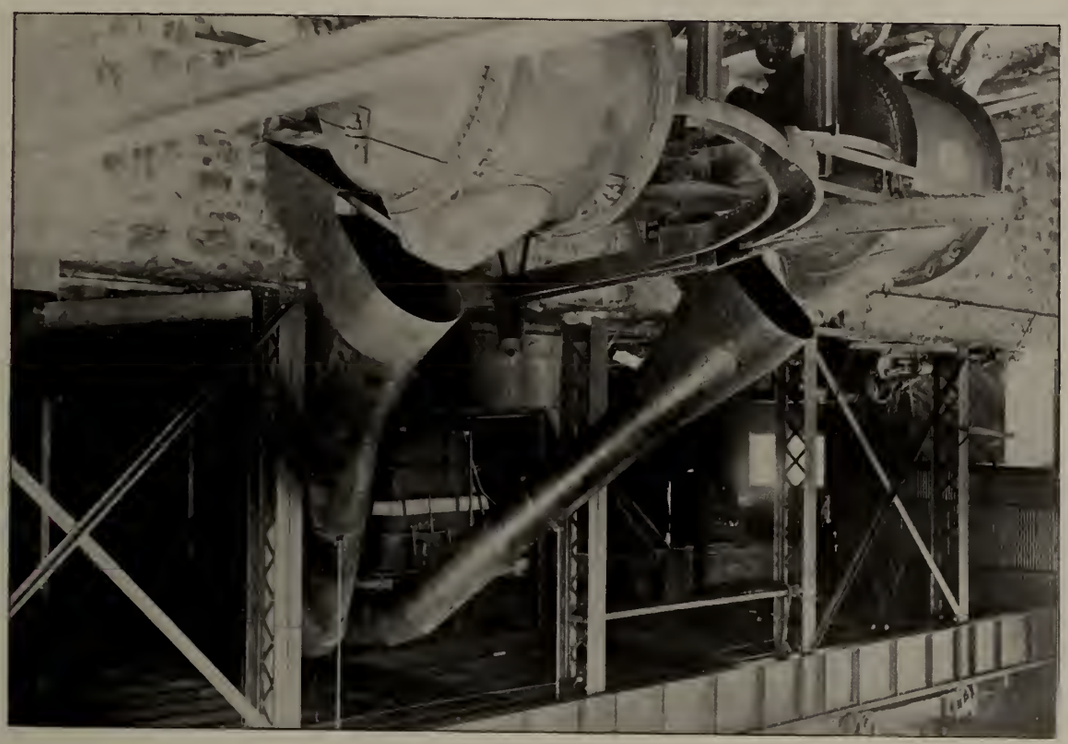

Photo showing Bessemer Convertors in foreground, and one of the S nelters in background—Mond Nickel Company, Whitefish, Ont.

Another view of the New Plant of the Mond Nickel Company at Whitefish, Ont.

Bruce Copper Mines of Ontario, Limited—New Plant at Bruce Mines in course of construction.

Bruce Copper Mines of Ontario, Limited—New Milling Plant at Bruce Mines.

Fine new Boarding House just completed for employees of Bruce Copper Mines, Limited.

Another pile of Silver-Lead Ore awaiting shipment at Whitefish, B.C.

Interior of one of the great Asbestos Quarries worked by King Bros. at Thetford Mines, Que.

Interior of Big Pits—King Bros. Asbestos Mines, Thetford, Que.

for another hundred feet the tunnel is in practically barren ground, hard as flint.

It is interesting to note one possible exception to the rule that the ore occurs only in this gossan form. On one of the claims which I visited, there was what really looked like a vein cutting not only the surface gossan but the peridotyte as well, this latter rock being shattered and almost slaty in the vicinity of the fissure, this vein being some two feet wide, and giving a fair assay of nickel. It is from this vein that considerable of the ore shipped to New York was taken. There were numerous tunnels from one hundred to two hundred feet in length, but all had the characteristics of the 350 foot tunnel above described.

With a view of suggesting the best means of treating this ore I had made a complete analysis of the hand-sorted mineral from the vicinity of the so-called vein, the result being as follows:—

	Per cent.
Silica	59.44
Sesquioxide of Iron	6.40
Alumina	0.41
Manganese Peroxide	0.33
Lime	1.11
Magnesia	16.27
Sulphuric Acid	0.30
Arsenious Acid	0.60
Nickel Oxide	8.23
Loss on ignition	1.00
Undetermined chiefly Potash and Soda	5.91
	100.00

It will be observed that this ore does not differ materially from the New Caledonian product, so that if enough 7 per cent. ore can be obtained it can be handled just as is this new Caledonian ore, but the future of the property will probably depend upon the ability to handle the low grade material without sorting. Nowhere should there be cheaper mining, as the deposit is superficial and so rotten that it could be excavated by a steam shovel with little assistance. If iron sulphides containing gold or copper sulphides can be found in the vicinity, the ore could be readily smelted into a matte, carrying all the metals of value, the subsequent treatment being such as is now given to the Sudbury product.

There is a possibility, also, that the methods of magnetic separation, which are now being applied successfully to low grade metallic sulphides such as zinc blende carrying small percentages of iron, can also be applied to these nickel ores; if the mineral may perhaps be simply crushed, dried and sized, the magnet separating the oxide and silicate from the iron and quartz. Experiments are being made in this direction.

In closing I venture to record my opinion that some of the nickel deposits of the United States need only the stimulus of an export duty on Canadian nickel to become regular producers, and to state that the mere agitation of the question of an export duty has brought experimental cargoes of Australasian and Norwegian nickel ores to New York for smelting.

Having demonstrated the fact that these ores can be handled economically in New York other contracts are being entered into, so that somewhat to the surprise of all concerned the United States finds itself independent of the Sudbury ores should it become necessary to do without them. It must not be forgotten that the freight from New Caledonia to New York, being all by water, is always quite as low as are the railroad rates from Sudbury and can be made lower yet by chartering vessels for a round trip. There has recently been considerable talk of a bounty on Canadian metallic products. When Canada offers a bounty she stretches forth her hands in welcome to the miners of all lands: when she imposes an export duty, thus shutting the door in their faces, she must not be surprised if other doors now open are closed to her products in turn.

SILVER LEAD.

Large Deputation of B.C. Mine Owners ask Government for bonus to establish Lead Refining Plant.

On Monday, 15th inst., a very large deputation from the Kootenay District of British Columbia, interviewed the members of the Government with the object of securing a bonus towards establishing Lead-refining in Canada. The deputation comprised:—J. Roderick Robertson, General Manager, and S S. Fowler, Mining Engineer of the London and B.C. Gold Fields, Nelson; H. E. Croasdaile, Nelson; George Alexander, Managing Director, Kootenay Ore Co., Kaslo; A. W. Goodenough, Mine Owner, Kaslo; D. Heap, Last Chance Mine, Sandon; G. F. Ransom, Slocan Sovereign Mine, Sandon; A. B. Clabon, and J. Ferguson McRae, Rossland; G. G. Henderson, H. Bentley, and C. P. Hill, Fernie, B.C.; Mayor Carlson, Ald. F. E. Archer, and Ald. W. V. Papworth, Kaslo; G. O. Buchanan, Kaslo; J. H. W. Smythe, Greenwood, B.C.; W. H. Adams, M. L. Grimmett, C. Cliffe, and J. Vallance, Sandon; and B. T. A. Bell, Secretary Canadian Mining Institute. Accompanying the delegation, and headed by Mr. W. A. Galliher, M.P., were a large number of Members of Parliament and Senators from various sections of British Columbia.

The company was received in Sir Wilfrid Laurier's office at noon. There being present in addition to the Premier, Sir Richard Cartwright, M.P., Hon. W. S. Fielding, M.P., Hon. Clifford Sifton, M.P., Hon. Wm. Paterson, M.P., and the Hon. James Sutherland, M.P.

Having introduced the party to Sir Wilfried, Mr. W. A. Galliher, M.P., handed to the Premier, and to the other Ministers, a copy of the following Memoranda showing the urgent need of legislation in favor of the Silver-Lead industry of British Columbia:—

Bonus to Lead Refinery.

The mining of lead in British Columbia has grown into a most important industry. The production in 1900 amonnted to 60,000 tons of

of silver-lead ore, containing silver to the value of	$2,295,099 00
And about 30,000 tons of metallic lead of the value of	2,690,577 00
Or a total of	$4,985,676 00
And the total production for all years to date has been	$20,000,000 00

At the first of the present year it was estimated that an output of more than 100,000 tons of ore, containing 50,000 tons of lead, would be reached in 1901. This is an expectation, in consequence of events that have since occurred, which will however be greatly disappointed.

The bulk of all of this class of ores hitherto mined in British Columbia, has been smelted in the United States, and the portion of it that has been smelted in Canada, has also gone to the United States to be refined.

At the beginning of 1901, the American Smelting and Refining Company, a trust which has absorbed nearly all the smelters and refineries in the United States, gave notice that it had withdrawn from the British Columbia market, and that until further notice it would make no contracts for the treatment of British Columbia ores.

The capacity of the Smelters in operation in British Columbia, and of the independent smelters in the United States, is totally inadequate to treat the normal output of the British Columbia mines, and many of the mines have in consequence closed down, and others have lessened their output.

It is still possible to have bullion that has been smelted in Canada, refined in the United States, but the refining charge has been greatly increased, and there is no tendency observable toward an increase of the smelting capacity in the districts now suffering. Nor is there likely to be, while the danger of the imposition of excessive rates for refining continues.

It is the opinion of this Delegation that for the relief of the distress at present existing, the surest and best remedy is the establishment, in some accessible situation within Canada, of a Lead Refinery, and that inasmuch as the establishment and successful operation of such a Refinery would require the employment of a large amount of capital, not only in the construction and equipment of the Refinery, but also in the purchase, treatment, transportation and marketing of the product, and inasmuch as the investment would be exposed to the danger of destructive competition from the American Trust, whenever it chose to re-open its works to Canadian lead, your memorialists respectfully sub-

mit that the Dominion Government should grant a bounty, to be paid for a term of five years, at the rate of $5.00 per ton upon pig lead, the product of ores smelted, and refined, in Canada.

We submit that the transfer to Canada of the industry of working up as far as possible our stock of raw lead, into manufactured forms, and the opening of an outlet through Canadian channels to the world's market, for the whole of the product, is a matter of importance to the Dominion at large; that the production of silver and lead in British Columbia is capable of great expansion; that the employment of labour afforded, will attract to the mining districts a large population of consumers upon a lavish scale of the supplies and products of Eastern Canada; and that in all respects the measure of development liable to follow the removal of the obstacles that now retard the industry will amply justify such expenditure of public funds, as the granting of our request would involve.

Your memoralists respectfully request that the rates to be charged for refining, by any refining company, proposing to take advantage of any Bonus provided by the Government, be made subject to approval, and revision by the Governor General in Council, and that full power be reserved by the Government to withhold the payment of money claimed to have been earned by any refining company if it be at any time made to appear to the satisfaction of the Governor General in Council that any excessive charges have been imposed, or unjust discrimination practised by such refining company, as against any Canadian product treated by them or offered to them for treatment.

LEAD DUTIES.

The inequality of the duties levied upon lead products coming into Canada has been repeatedly brought before the Government by special delegations and by the Board of Trade, and dealt with by the Convention of the Liberal party in the platform upon which Mr. Galliher, the present Member for Yale Cariboo Kootenay was elected.

It appears that the schedule of lead duties stands as it was framed many years ago when there was no production of lead in Canada. It is inconsistent with itself and with the tariff upon other goods of a similar class, and it operates to discourage the manufacture of lead in Canada, so that while we are producing and sending abroad a large quantity of lead in crude forms the Canadian market is supplied with the manufactured article from abroad. We ask the Government to revise this tariff and put it upon an equitable basis, which in our opinion would be reached by an increase of the duty upon pig lead from 15 per cent. to 20 per cent., and upon dry white lead from 5 per cent. to 25 per cent.

MINT.

That this Delegation respectfully urges upon the Government the consideration of the Mint question as brought before them in the memorandum of the Premier of British Columbia of January 28th, 1901.

RAILROADS.

We strongly believe that the requirements of Southern British Columbia demand the construction of Railways through the rich and undeveloped portions of Southern British Columbia, and that permission to build, and financial assistance where necessary, should be given to to any responsible company intending to build a railway, whether crossing the International boundary or not, subject in all cases to Government control as to rates, and subject to such regulations as will afford protection to Canadian industries as to coal and coke supply, where such railways are designed to tap coal deposits upon which such Canadian industries are dependent for their fuel.

Signed on behalf of the Delegates.

DAVID HEAP, *Chairman.* M. S. LOGAN, *Secretary.*

MR. J. RODERICK ROBERTSON,
General Manager,
London & B.C. Gold Fields, Ltd., Nelson, B.C.

MR. S. S. FOWLER, S.B., M.E.

MR. H. E. CROASDAILE,
Late General Manager,
Hall Mines Smelter, Nelson, B.C.

THE NELSON REPRESENTATIVES ON THE KOOTENAY DELEGATION WHICH INTERVIEWED THE GOVERNMENT THIS MONTH.

Mr. GEORGE ALEXANDER, of Kaslo, Managing Director of the Kootenay Ore Company and other enterprises, said :—The crisis in the mineral situation of British Columbia, which has forced us to this appeal for aid from the Government, is briefly that our mines, which have been increasing steadily in production and are now producing more ore than ever before, are suddenly and without warning deprived of a market for their output. To take as an instance one concrete case, my own, the mines under my charge were increasing by steadily shipping during last year, when a few days before the expiration of the annual contracts at the end of the year, under which our ore was sold to the American Smelting and Refining Company, we were served with a notice through a local lawyer that the American Smelting and Refining Company would not accept any more of our product after the end of the year. Hoping that this would prove only temporary we continued working as long as possible, until at last our ore was piled up in our works and the railroad and steamer wharves to an extent which left

no further room or possibility of working : and then being unable to sell a pound of the ore we shut down our properties.

To understand the situation it must be borne in mind that the lead comes out of the mine in the form of ore containing on an average about one-half lead and one-half waste, separable only by smelting ; the smelting process produces base bullion cont ining lead and silver : and then the process of refining is required to desilverize the material, by separating the silver from the lead. Now the market for lead in Canada being necessarily a limited one, the American Government began by placing a duty of one and one-half cents per pound on lead in the shape of ore shipped into the U. S. for smelting, whilst charging a duty of two and one-eighth cents per pound, or twelve dollars and fifty cents per ton more, on lead, smelted in Canada. Having thus protected their market by a heavy preferential duty against Canadian smelting, they were then able to fix favorable rates for themselves in buying our ores which were smelted, refined and marketed in the United States. As long as there was any competition between the various American smelters, this gave us a certain market for our ores : but recently a combination or trust of practically all the smelters and refiners of the United States has been formed with a capital of one hundred million dollars : And with the object usual to trusts of keeping up by artificial means the prices of their product, their first step was to cut off the purchase of British Columbia ores, knowing well that under existing conditions this could only result in absolutely extinguishing the mining of B.C. lead ores and leaving the U.S. trust that much more free to manipulate the prices in the United States.

In Canada there are only two lead smelters in operation, both small, and unable from want of capacity to handle more than a fraction of the lead ore mined : a proof of this inability on their part is in the fact that I have been unable to sell to them during this year a single ton of the thousands of tons of ore already sacked on our various properties which are looking for a market. From these smelters the base bullion has to be shipped to the U.S. to be desilverized or refined, the charge for which process has hitherto been about eight dollars ; but, true to their tactics throughout, the American trust has now increased this charge by four dollars, or fifty per cent. The Canadian smelters are thus doubly at the mercy of the U.S. trust ; to market their product they have to pay whatever rates the trust chooses to exact from them : whilst the trust, protected by their preferential import duty of twelve and one half dollars per ton against Canadian smelting, can whenever they like cut in and underbid the Canadian smelters in obtaining the raw material.

The situation built up by this consolidation of American tactics seems to present the one form of necessity that calls most loudly for relief by the direct extension of a bounty to tide a young and struggling industry over the difficulties of its first start in the face of the declared hostility of a powerful opposition. There is nothing that we can see but direct Government aid to keep it alive now. The Canadian lead industry has been sentenced to death by the American Smelter Trust backed up by a specially devised exaction of the American tariff : and without special intervention by our own Government that sentence will stand.

Mr. H. E. CROASDAILE, Nelson, referring to the causes that have led to the present want of smelting capacity to treat the lead ores of B.C., said :

With the exception of the ores smelted by the Pilot Bay smelter practically all the lead ores mined in B.C. went to American smelters up to the year 1899. In that year the Trail Smelter joined the combination of American smelters and began accumulating lead ores, and the Hall Mines Smelter at Nelson, of which I was manager, began to purchase, and made a trial run on lead ores with one furnace. I found the competition of American smelters was very keen, and threats were used of putting smelting rates below a price at which we could afford to smelt if I did not join the combination. This course I found it advisable to pursue for the year 1900.

Up to last year there was no evidence whatever that the demand for lead ores in B.C. would not continue, and any new lead furnaces would have found it almost impossible to have obtained any tonnage of importance. However last year the abnormal rise in the price of lead brought into operation many low grade mines in the United States, and the American Smelting and Refining Trust was able to obtain its supply of lead more from home than than B.C., and the result was that towards the close of the year there was little competition by American smelters, and this year owing to the great Trust not purchasing any ores at all the available smelting capacity is quite inadequate to handle the output of the mines, and in consequence some mines are closed down, while others maintain only a reduced output.

One reason for not increasing the smelting capacity in B.C. has now therefore been at least temporarily removed, but a more powerful reason still prevents the increase of smelters. The product of the smelters in the form of base bullion must still be sent to the American refineries before it can be marketed and the price charged for refining has a very important bearing on the prices charged for smelting. The American Smelting and Refining Trust has recently announced its intention of increasing its charge for refining lead bullion by $4 per ton ; this means a corresponding increase in smelting rates, which in the case of an ore carrying 50 per cent. lead will amount to $2 per ton. It is therefore evident that although the competition in crude ores has ceased from the American side for the present, that the power still exists there of seriously hampering the lead mining industry of B.C. and the road is kept open for the Trust to again become a competitor for B.C. ores, at any time it may want to do so if the B.C. smelters are forced to maintain a high smelting rate through excessive refining charges.

The freedom of the lead mining industry of B.C. from the incubus of American control is absolutely essential for its increase, its prosperity and, possibly, for its very existence as a paying industry, and the only way to insure this freedom is by becoming independent of American refineries. The erection of a refinery in Canada is the solution of the difficulties now besetting lead mining, for with the certainty of reasonable refining rates the increase of lead smelting works in the district is assured.

I trust we may soon see the entire output of the lead mines of Canada, smelted and refined in Canada, and taking the yield at 120,000 tons of 40 per cent. f.o b. ore that it was estimated these mines would yield for the current year, had no difficulties arisen the expenditure for labour, fuel and fluxes would amount to some $2,000,000 annually, and it is important to bear in mind that this expenditure will be paid for by money won from the mines, by money newly gained and added to the wealth of the country. Surely it is of the greatest importance to retain the expenditure of this large sum that will be annually increasing in Canada and for the benefit of Canadians and stop the heavy toll the American smelters and refineries have hitherto levied on the crude product of our mines and smelters.

Mr. S. S. Fowler of the London and B C. Gold Fields and Mr. D. Heap of the Last Chance Mine, followed, strongly endorsing the plea for assistance towards lead refining, citing the experience of their respective companies as to the present greatly depressed condition of the lead market.

G. O. BUCHANAN, President Kaslo Board of Trade :—I wish to speak on behalf of the commercial communities of Kootenay. I have lived 15 years in Kootenay. I am not a mining man, I am a lumberman. I saw the first shipment of silver-lead ore from Illecillewait in 1888, and I have been in the midst of it ever since. The business has sustained a series of difficulties, and misfortunes. The first drawback was naturally the lack of trails, and later of roads ; to a large extent these were supplied by the mine-owners, aided by the commercial people of the districts. The people of Kaslo in 1892 raised by subscription, and expended upon the road from that city to the Slocan mines, $20,000. For three years this was the chief outlet for the ores of the Slocan. Then if we did not build railways, we agitated for them, until we got them. I wish to say just here that I do not think that any expenditure that we have ever asked either of the Governments to make, has not when made, been amply justified by the results that have followed. In 1893 the price of silver suddenly fell from $1.16 per oz. to 55 cents, and later to 51½ cents, its coinage value being $1.29. Then the duty on lead going into the U.S. was raised by the Dingley tariff from $15.00 per ton upon lead in ore, to $30.00 per ton, and from $20.00 per ton upon lead in smelted bullion, to $42.50 per ton. Then the British Columbia Legislature cut down the length of the mine shift from 10 hours to 8 hours, and there was a year of dead lockup on the question of the readjustment of the rate of pay. Each of these shocks prostrated for the time being the silver-lead mining industry, and from each of them it recovered, the mine owners adjusting themselves as best they could to the changed conditions. In 1900 the labor trouble was not settled until April, and in July the British Columbia Legislature doubled the tax upon output increasing it from 1 to 2 per cent., yet from the time that the mines resumed, until the end of the year, chiefly owing to the fact that the St. Eugene, the North Star, and the Sullivan mines in East Kootenay, for the first time entered the lists as large shippers, the output went to figures much in excess of those of any previous year. There was scarcely a cloud in the sky as regards the outlook for the present year, until the announcement came that the United States smelters would not treat British Columbia ores. The citizens of Kaslo put their shoulders to the wheel, in the hope that they would be able to do something to relieve the situation. The City Council of Kaslo, which body is represented here today by the Mayor and two of the Aldermen, submitted two By-laws to the ratepayers, one providing for exemption from taxation for a term of years

of a smelting plant, the other for a bonus of $50,000, in aid of a smelter. Both By-laws were carried, the first with only two dissenting votes, the second unanimously. A smelter company has been incorporated, and $10,000 of the stock locally subscribed for. But in seeking to interest capital in the scheme, we have been met with the objection that until refineries are established in Canada, there is no chance for the successful operation of more smelters. In making the appeal we do for assistance from the Dominion, we do not regard ourselves as entirely asking for charity. It is generally admitted that Britiah Columbia is a contributor on a scale somewhat out of proportion to the revenues of the Dominion, the receipts per capita, comparing it is said as 55 to 20, with the average for the Dominion, and according to the memorandum prepared by the Provincial Government, aggregating nearly two millions of dollars in excess of actual annual expenditure in the Province. We claim that this excess is largely derived from the mining districts. The census will in our opinion, show a population in the mining districts of Southern Kootenay and Yale of 50,000, largely a population of adult males. Purchasers upon an extravagant scale, not only of food and raiment, but of machinery, tools, building material, and outfit, and appliances of all kinds for industrial purposes. We buy largely from Spokane, San Francisco, and Chicago, tea, sugar, tobacco, clothing, fruits and bacon, goods upon which we pay duties at the Custom House; and we buy largely beef, butter, oats, flour, and poultry, from the Canadian prairies; and we buy largely machinery, horses, hardware, boots and shoes, whiskey, and canned goods from Ontario and Quebec. Mr. Dunsmuir has suggested that in view of the large revenue received, the Dominion Government should contribute liberally in aid of railways in the mining districts, but I am sure that in the crisis that has arisen, Mr. Dunsmuir would agree with us that there is no railway scheme, upon which the expenditure of a million dollars, spread over the next five years, would accomplish as much for the development of the Province, as the establisment of a lead refining plant. It is not only a question of relieving and reopening the existing mines. The whole of Kootenay is lead producing—probably much of the adjacent territory. Hundreds of square miles are plastered with mineral locations, on nearly every one of which a mineral showing of some kind exists. As long as the smelting is done in the United States, the low grade properties will never be developed, but with home smelting they will be, and four times the amount of mining will then go on in the silver-lead mining districts of the Province. The value of the output will not be increased in that proportion, but the disbursements in the country will be. We are not entirely selfish either in the request we are making, there is at stake the development of a large industry in the manufacture of lead,—an industry which will locate itself here in the east. We do not particularly expect to have the refineries for which we are seeking specific aid, located in the west. They will be establi hed wherever the investors find most convenient, on Lake Erie or perhaps at Montreal. With pig lead cheap and abundant in Canada, our sheet lead will be pulled, and our lead pipe will be drawn in Canada, and the 6,000 tons of lead annually mixed into paint in Canada will be corroded at home, although probably some slight rearrangement of the tariff may be necessary to bring that about. At present lead as it comes out of the mine is worth slightly less than nothing. If the mine manager had the silver out of it, he could let it go over the dump, but unfortunately to get the silver, he must haul it to the railway, and pay railway freight upon it and pay for having it smelted, and for having the silver taken out of it in a refinery. So this lead which is worth nothing at the mine, goes through a United States smelter and a United States refinery, and to the Atlantic coast of the U. S. and to London and is there corroded, and becomes raw white lead, fit for paint. Then a portion of it comes out around the Horn to Victoria, and is worth there in a wholesale way 8 cents per pound; finally a small fraction of it comes up into the mining camps, and we who live there buy it at 13 cents per pound. This is an extreme case, but it represents what on the whole we are now doing. We are giving away this raw material and buying back in manufactured forms after it has made the circuit of half the globe, at least a part of it, and we are paying not only for all the skill and labor, that the foreigner has bestowed upon it, but the freight bill that has accumulated against it as well. I had the day before I started on this trip, an interview with Mr. Campbell, Manager of the Hall Mines Smelter at Nelson. He said: "If through the establishment of a refining plant, any better price comes to us, for our bullion, we will give the benefit to the mine owner. We desire an opportunity to increase our business, not increased rates for smelting." We are asking for this bonus for a refinery, because a refinery will supply the missing link between the smelters and the market. The refinery will take the bullion from the smelters, and enable the smelters to take ore from the mines. It will open up an all Canadian channel, between the mines and the ultimate world's market, for our lead product, but it will also, incidentally transfer to Canada a new and valuable industry, afford an opportunity for a large number of Canadians to get employment, and a profitable investment for a million or two dollars of Canadian capital.

Mr. J. Roderick Robertson, General Manager of the London and B. C. Gold Fields, Nelson, concluded the addresses by a short and forcible appeal on behalf of his company that the bounty, or some other equally suitable assistance, be given to the lead miners of British Columbia with a view to creating a market for their ore intirely independent of the American Trust. Mr. Robertson having thanked Sir Wilfrid and the Ministers for their courteous hearing, the compauy retired much pleased with their reception.

NICKEL LEGISLATION.

Strong Delegation of Canadian Mining Men Present to Dominion Cabinet a Strong Plea for Disallowance of Ontario Act.

On Thursday, 11th April a very large and representative deputation of Canadian Mine owners and Mining Engineers visited Ottawa and had an nterview with Sir Wilfrid Laurier, the Premier, and his ministers, with the object of securing the disallowance of this Act, passed last year, by the Ontario Legislature, reserving the right to impose a prohibitive license tax on the export of nickel and copper ores and matte produced in Ontario.

The deputation was received in Sir Wilfrid's Office, there being present besides the Premier, the Hon. Edward Mills, Minister of Justice, the Hon. Clifford Sifton, M.P., Minister of the Interior, and the Hon. A. C. Blair, M.P., Minister of Railways and Canals.

The deputation comprised: Hiram Hixon, M.E., Mond Nickel Co., Whitefish, Ont.; B. T. A. Bell, Secretary Canadian Mining Institute, Ottawa; George R. Smith, M.L.A., General Manager Bell's Asbestos Company, Black Lake Que.; J. Roderick Robertson, General Manager London and British Columbia Gold Fields, Limited, Nelson, B.C.; Wm. Blakemore, M.E., Montreal; Dr. Frank D. Adams, Montreal; Leopold Meyer, M.E., Cataraqui Mining Co., Madoc, Ont.; J. P. Kirkgaard, General Manager Canadian Gold Fields, Ltd., Deloro, Ont.; S H. Flemirg, Ontario Graphite Co., Township of Brougham, Ont.; J. R. Blaikie, President Board of Trade, Subbury; James Stobie, Mine Owner, Sudbury; W. A. Allan, Mine Owner, Ottawa; Russell Blackburn, Mine Operator, Ottawa; James D. Sword, M.E., Rossland, B.C.; S. S. Fowler, M.E., Past President Canadian Mining Institute, Nelson, B.C.; J. M. Clark, K.C., Toronto; Francis T. Peacock, Montreal; A. P. Low, late Geological Survey of Canada, J. C. Gwillim, M.E., Ottawa; A. O. Buchanan, President Board of Trade, Kaslo, B.C. and a number of others prominently identified with the mining industries of the Dominion.

The party was introduced to the Premier by Messrs. McCool, M.P. for Nipissing and Dyment, M.P. for Algoma. A number of members of the House were also present including Col. Prior, M.P. and Mr. Earle, M.P. for Victoria, B.C.

Mr. B. T. A. Bell, Secretary of the Institute explained that the deputation would ask the Government to disallow the "Act to Amend Mines Act" passed at the last Session of the Ontario Legislature. They would also present the views of the Institute on the vital necessity of increasing the salaries of the members of the staff of the Geological Survey and of providing safer and more suitable accommodation for the invaluable collections of that institution.

Mr. J. M. Clark, K.C., of Toronto, and counsel for Dr. Ludwig Mond, of London, England, strongly urged the exercise of the power of disallowance in this case. He pointed out that Dr. Mond had purchased his properties in the province of Ontario on the faith of the most solemn declaration of the Ontario legislature to which the Crown was a party, that such lands and the ores and minerals therein "shall be free and exempt from every such royalty tax or duty," such as those now sought to be imposed.

After Dr. Mond had purchased his properties and invested largely, an Act was introduced into the Ontario legislature giving authority to impose the taxes now complained of.

Upon it appearing that such tax was expressly in the teeth of the previous legislative declaration the word "tax" was changed to "license fee," but this Mr. Clark argued did not alter the nature of the legislation which

was a gross breach of faith. Mr. Clark then demonstrated that the amount of the tax or license fee authorized exceeded largely the value of the ores or matte taxed, so that the legislation directly authorized confiscation. and if not disallowed there would be no security for investments in Canada, Mr. Clark urged that as the confiscation authorized was not for the purpose of dealing with property or civil rights or for the purpose of raising a provincial revenue, but for the purpose of attempting to regulate trade and commerce and the refining and smelting industries, it trenched upon Dominion jurisdiction and should be disallowed. Mr. Clark showed that no such provincial legistation had been allowed to go into operation and that if this act were not disallowed, it would form a dangerous precedent. So far the precedents were all in favor of disallowance and instances were cited where provincial acts not nearly so objectionable as the present one had been disallowed by previous Dominion governments. A strong point was made of the fact that if the time for disallowance is permitted to expire, there is no power to disallow any order-in-council, no matter how objectionable that may be, passed under the authority of the act. This in itself had been held by the Mackenzie government as sufficient grounds for disallowance. The report of the Hon. Edward Blake in favor of disallowance, in that case had been confirmed by order-in-council and the same course should be followed in the present instance. The exclusive jurisdiction over trade and commerce, had been entrusted to the Dominion authorities and such powers as those now in question should not be delegated to a provincial government. To permit this would deprive British subjects of a constitutional safe-guard to which they were entitled under the British North America Act, besides international complications for which the Dominion government would be responsible would be caused if such legislation is not disallowed. Dominion interests will greatly suffer if this act is allowed to go into operation as it is a great blow to the credit of Canada Mr. Clark said that no interests would suffer from the disallowance of the Act complained of.

Mr. Hiram W. Hixon :—I wish to call your attention to the widespread and mistaken ideas about the extent and grade of the Sudbury nickel copper ores. It has been reported by unreliable and incompetent parties that there were hundreds of millions of tons of nickel copper ore in sight and that the grade was much higher than is the case. Statements which have given rise to the desire that the public should share in the fictitious wealth and is one cause of the mysterious legislation which we wish disallowed. In my capacity as Dr. Mond's agent it has been my duty to traverse the nickel copper country and sample the ore deposits. From my personal knowledge I can state that if there was one-tenth part as much ore as has been reported there would be much larger deposits than actually exist. The average yield for the whole district will not exceed three per cent. of the combined metals, about one-half nickel and one-half copper which would be thirty pounds of copper per ton, thirty pounds of nickel per ton, the net value of the copper and nickel in the ore after mining is at the present market price of the metals ten cents for copper and twenty cents for nickel :

30 pounds of copper at 10 cents	$3 00
30 pounds of nickel at 20 cents	6 00
Total net value one ton mined	$9 00
Less cost of mining	2 50
Remainder	$6 50
Proposed tax	7 00

I do not wish to say that we do not have ores that contain more nickel and copper than these figures, but taking the average of all the ores of the district the yield or marketable metals would not exceed three per cent. There are a few deposits being worked which yield ores containing 6 to 7 per cent. combined metals and it is only natural that these should be mined first, but I submit that the average yield of the district will not be above three per cent. mark. From these average results it will be seen that the imposition of the tax would amount to confiscating the properties.

Mr. James Stobie, one of the oldest and most successful prospectors and property owners of Sudbury, who has been associated with the copper-nickel mining industry since its inception, cited instances where large foreign investments in nickel lands had been stopped by the intimation of this taxation.

Mr. Blaikie, president of the Sudbury board of trade, presented a resolution which had been unanimously adopted by that body asking the government to disallow the act.

Mr. B. T. A. Bell, Secretary of the Canadian Mining Institute, pointed out that the belief so general in the country that Canada controlled the world's supp'y of nickel was entirely erroneous. We had undoubtedly a very large and valuable territory of nickel and copper resources which during the past sixteen years, entirely unaided by government bounties or assistance of any kind, had developed large and prosperous mining and smelting industries.

These industries should be allowed to expand along natural lines. New Caledonia, Norway and other countries were now formidable competitors with Canada in the American market for nickel and were shipping very large quantities of ore monthly into New York and any such taxation as that proposed by the Ontario Act would tend to an increase of these importations and would most surely be hostile to the continued prosperity of the copper-nickel mining industries of Ontario. Nickel refining, however desirable as a Canadian industry was not economically available by any known metallurgical process at the present time and, even if it were, the policy of protecting a refining industry at the expense of the ore producer was ridiculous and entirely wrong. The mining industry, and by the mining industry he meant the miner, not the smelter or refiner, received no consideration from the government, no bounties were paid him on his output nor did he want any—all that he wanted was to be left alone. The Ontario Mines Act was not only unconstitutional but it was inexpedient. It was a menace to the investment of capital, for no investor would put a penny into Ontario copper-nickel lands as long as such prohibitive taxation was likely to be imposed. Perhaps Sir Wilfrid would remember the Quebec Mining Act passed by the Mercier administration nine or ten years ago. That Act was very similar to the legislation of the Ontario Government in as much as it sought to impose taxation upon mining property which had already been sold or alienated from the Crown unconditionally. On the representations of the mine owners of Quebec the Dominion Government had exercised its influence to have that legislation withdrawn. Such action by the government now would greatly accelerate the present great expansion of mining industry in Ontario.

Mr. George R. Smith, M.L.A., manager of the Bell's Asbestos company, stated that while he was more directly concerned in mining in Quebec the provisions of the Ontario Mines Act viewed from a practical standpoint were inexpedient and unwise. Foreign capital, so much desired in Canada, was not likely to be invested while such prohibitive taxation was at all likely to be enforced.

BETTER SALARIES FOR GEOLOGICAL SURVEY.

Dr. Frank D. Adams, Montreal, followed with a strong appeal on behalf of the Geological Survey. The entirely inadequate renumeration paid to the officers of this most important branch of the public service was rapidly depleting the survey of the men whose knowledge and skill were so much desired. He cited the names of Tyrell, Coste, Carlyle, Dr. Lawson, Low and many others who had left in recent years for more remunerative positions. While the government could not hope to compete with mining corporations in the matter of salaries the remuneration paid was altogether too small. He also directed attention to the entirely unsafe and inadequate housing of the Survey and the urgent desirability of having accommodation provided in keeping with the invaluable character of the survey's collections.

Mr. B. T. A. Bell :—It was intended to have presented some facts concerning the present greatly depressed condition of the silver-lead industry in British Columbia and the desirability of the government extending some assistance to the lead refining, but as a large deputation from the west had just arrived in the city for the same purpose, it would be better to postpone this discussion until a later interview. The deputation then withdrew.

Mineral Discoveries in the Kingston District.—The discovery of various "shows" of zinc blende and galena, and also, it is said, of Franklinite, in the Township of Bedford, north of Kingston, and a few miles east of the Kingston & Pembroke Railway, gives occasion to remark that it is really surprising that the galena deposits of that region, well known over 50 years ago, have never been developed. A considerable tract of land, through which galena was superficially traced, was acquired by a Mr. Hunt, who did nothing with his property. The Frontenac Lead Mine was opened on the same formation in Loughborough Township by an English Company whose resources were spent, it is reported, mainly in riotous living. Now that the more valuable mineral, zinc blende, has been discovered, it is hoped that the enterprise of Kingston capitalists, guided by the savants of the Kingston School of Mines, will be equal to the task of developing these new discoveries.

Successful Annual Meeting at Halifax. President Libbey Handles Without Gloves Fake Gold Mining Schemes in Nova Scotia.

The annual meeting of The Mining Society of Nova Scotia was held, pursuant to notice, at the Halifax Hotel, on Wednesday the 10th day of April, 1901, at 10:30 a.m.

President W. L. Libbey occupied the chair.

The following gentlemen were present: Vice-President G. W. Stuart, Truro; Past-President H. S. Poole, Halifax; J. E. Hampson, Halifax; R. H. Brown, Sydney Mines; Charles Fergie, Westville; A. A. Hayward, Waverley; F. H. Mason, Halifax; J. H. Austen, Halifax; G. S. Troop, Halifax; A. McNeil, Halifax; H. M. Wylde Halifax; F. W. Green, Halifax; G. L. Burritt, Halifax; W. R. Askwith, Halifax; D. Forbes Angus, Treas. I. Co. M. Co., Montreal; T. R. Gue, Halifax; George E. Francklyn, Halifax; C. C. Starr, Halifax; Sydney Smith, Halifax; F. W. Hanright, Halifax; H. W. Weller, Montreal; Hon. S. H. Holmes, Halifax; D. W. Robb, Amherst; Percy Brown, Halifax; C. N. Crowe, Bridgewater; J. W. Pilcher, Halifax; Todd C. Woodworth, Halifax; Harry Piers, Halifax; Frederick Taylor, Boston; G. J. Partington, Hon. Robt. Drummond, Hon. Angus McGillivray and a large number of others.

The Secretary read the minutes of the last meeting, which were read and approved.

NEW MEMBERS.

The names of the following gentlemen were proposed for membership: F. W. Green, Halifax; J. W. Pilcher, Can. Genl. Elect. Co., Halifax; Marland L. Pratt, Crow's Nest Mining Co., Boston; C. J. Coll, Genl. Manager Acadia Coal Co.; L. F. S. Holland, Waverley G. M. Co., Waverley; Todd C. Woodworth, San Francisco; Sydney Smith, San Francisco; C. N. Crowe, Bridgewater; A. B. Kenyon, Mt. Uniacke; A. J. Moxham, Genl. Manager Dom. I. & S. Co., Sydney; William Bolase, Manager New Egerton G. Mining Co., 15 Mile Stream; E. F. Harvey, St. Johns, N.F.; Sydney Wood, St. Johns, N F.; Otto Collings; Hon. S. H. Holmes, Halifax; J. C. Mahon, Halifax and D. Forbes Angus, Secy. Intercolonial Coal M. Co., Montreal; C. H. Porter, Halifax; F. A. Huntress, Manager Halifax Elect. Tram Co., Halifax; Fred W. Hart, Halifax; L. J. Hesslein, Halifax; E. Howard Hughes, Montreal.

On motion the ballot was dispensed with, and on motion of Mr. H. M. Wylde, seconded by Mr. F. H. Mason the above gentlemen were declared duly elected members of the Society.

ELECTION OF AN HONORARY MEMBER.

Mr. ALEX. McNEIL: I should like to move that Mr. Harry Piers be made an honorary member of the Society. As members are aware, Mr. Piers as Curator of the Provincial Science Library and Museum is doing most valuable work, one that is going to be of importance not only to the mining interests but in our own and those of the Province. I therefore have much pleasure in making this motion.

Mr. H. S. POOLE: In connection with Mr. Piers I would like to remark, as some of our members may not be aware of it, that the bulk of the Library belonging to this society has been placed under Mr. Piers' care, and that he is now looking after most of our books, and the intention is, I believe, to place other volumes as they are bound similarly. A record will be kept of them and they will be systematically looked after. Mr. Piers is an enthusiastic naturalist, and takes great interest in all scientific studies, and as secretary of the Nova Scotia Institute of Science he would bring this Society more in touch with that Society.

Mr. FERGIE concurred.

The motion having been put, Mr. Piers was unanimously elected an honorary member.

MEMBERS REMOVED BY DEATH.

Mr. H. M. WYLDE expressed regret at having to call the attention of the meeting to the loss by death of two members of this Society, Capt. A. L. Howard and Mr. Geo. A. Pyke, as well as that of Dr. G. M. Dawson, one of our honorary members.

The PRESIDENT: It would seem fitting that some resolution be passed by the Society in connection with the loss sustained. Mr. Pyke was a member of the Society for many years, and took a great deal of interest in its proceedings. He was a member of the gold mining branch and a most estimable and whole-souled gentleman, whose loss I think all of us individually deplore. Major Howard was one particularly well known to all of us—of large soul, a citizen of the world, a patriot—who in South Africa has given up his life for the British flag. We certainly all deeply deplore his loss. Dr. Dawson's services as a geologist to Canada will live in history. A Nova Scotian born, his services have been national, and will live long after I am forgotten.

PRESIDENT'S ADDRESS.

The President, Mr. W. L. LIBBEY: Gentlemen of the Mining Society of Nova Scotia—The closing year of the century has gone into history ripe with culminations in the mining records of this province, and of the greatest interest to our Society. Our scientific and practical miners are the men who above all others have in the past and will to a vastly increased extent in the coming century contribute to the enlargement of the industrial and commercial resources of Nova Scotia.

COAL AND IRON INDUSTRIES.

The quantity, quality, and availability of coal and iron are questions which weigh against the destiny of nations. Already the products of our matchless coalfields are reckoned in one of the greatest economic questions of the age—that of fuel—and the certainty of iron production is a coming event which casts a most portentous shadow.

INCREASED GOLD PRODUCTION.

Our gold output is furnishing an increasing addition annually to the least evanescent form of wordly wealth. On every hand scientific development is taking the place of aimless wandering in recovering earth's treasures; trained thinkers are superseding brute force; and perfected machinery is retiring for ever the crude appliances of the past. It is with no ordinary emotion of pleasure therefore that I greet today this representative gathering of all of Nova Scotia's mining interests.

GROWTH OF THIS SOCIETY.

It is good to note that our society is gaining in numbers and influence, and that, as is evidenced by our Secretary's report, we are in a satisfactory financial condition.

VISIT OF THE AMERICAN INSTITUTE.

As you are all aware, our Society, in conjunction with the Canadian Mining Institute, had in August last the pleasure of entertaining a large delegation of members of the American Institute of Mining Engineers on a most successful and interesting trip from Quebec to Cape Breton, Newfoundland, New Glasgow, Westville, Stellarton, Pictou, and Halifax. To the unceasing labors of Mr. B. T. A. Bell and our Secretary, Mr. H. M. Wylde, are due a large share of the words of praise for the successful outcome. The Government at Ottawa lent timely aid to the Canadian Society, and our local Government, with a ready comprehension of the importance of the visit, came to our aid in so substantial a manner as to enable us, by the use of a portion of the Society's funds, to entertain hospitably this very representative delegation of the leading mining engineers of the world.

In Cape Breton the Dominion Iron and Steel and the Dominion Coal Companies showered every attention and boundless hospitalities upon us. All details of the enormous plants and workings were open for inspection, and fully explained by an untiring corps of able members of their staffs.

The City of Sydney gave the hand of welcome. At New Glasgow, Westville, Stellarton, and Pictou a reception and warm greeting was given which will live in memory. Nature gave good weather in Halifax and Waverley, enabling the days to be filled with excursions and investigations which will be remembered.

The far-reaching effects of this visit of capitalists and agents of capital, to the most of whom the industrial resources of this Province were practically unknown cannot be over estimated. It is regretable that so few of our own members were able to take the trip.

REVISION OF THE MINES ACT.

A revision of the Mines Act has been effected in the past year which it is to be hoped will give general satisfaction. The work of revision having been in most able hands and suggestions and criticisms from mining men being given careful attention.

MARKED PROSPERITY IN THE COAL TRADE.

The increased and increasing market for coal has for the first time taxed our collieries beyond their capacity for delivering, the Provincial Treasury is becoming plethoric from royalties, coal miners are as well paid as in any part of the world and work less, indeed with the prospective increase of working collieries in view, the day can not be far distant when labor must be imported.

PROSPECTING FOR COPPER AND IRON ORES.

The prospecting and developing work done in the iron districts gives substantial reason for belief, that iron ore production will be au important feature at an early date.

In Cape Breton County there is good reason to hope for workable deposits of copper ore but on the main land I have yet to learn of any inducements to invest capital in copper. The discovery of copper stains in the mud on the banks of French River however was enough, in the opinion of certain gentlemen, to organize a million dollar company, call it the Copper Crown Mining Company, ask the Canadian Government for a bounty on copper, work Pictou for a free site, exemption from taxes for 20 years, etc., buy some second hand mining machinery, erect an alleged "smelter" and finally to energetically proceed to sell stock in the industrial towns of New England.

GOLD MINING.

The Gold Mining Industry is, I believe, in a more healthful state than ever before. Each year sees an increasing amount of legitimate development work done. The vital necessity of creating ore reserves is being forced on our operators and the altogether wasteful and vicious system of at once taking out every pound of ore uncovered is being slowly but surely relegated to the past. A goodly share of the work in all gold districts is being done by legitimate investment with out stock jobbing, at Waverly, for instance, where development has been in progress for some years there has been recently erected a magnificent plant and the public has not been asked to buy stock.

At Caribou extensive development on a large body of ore has been progressing for several years, the work beiug backed by private capital.

And, equally, in many other districts, honest and comprehensive work is being done which is sure to result in good not only to the operators but to the industry in general.

FAKE SCHEMES CONDEMNED.

I regret to have noticed several instances, however, where this Province has beeu made the base for schemes which need the light of day on them and, at the risk of wearying you, I will call your attention to some of the most flagrant. I have here a circular of "The Union Development Co." with "mines in Nova Scotia, California, Mexico and Montana, capital $5,000,000, Mr. J. Burpee Neily, Boston, Mass., President," etc. Now this man is exceedingly well known in his uative Province so you will not be surprised to learn that the attempts to float this scheme were in Worcester, Lawrence and other Massachusetts Towns and in Montreal. To give an idea of the probable reliability of all the claims in this circular I will quote and comment on one claim the "East Mine located at Brookfield, Queens County" from which the circular says: "Official returns (at the mines office) show that more than 5,000 tons of ore have been mined and milled from this vein producing an average of 19 dwts. to the ton."

Now this statement is true, but facts which he does not mention are equally true. I will supply a few. First, at the time of his statement no returns had been made at the Mines Office for over six years, although operations had been carried on the most of the time and for something over two years by Neily himself, and always at a heavy loss, incurred, in my opinion, by ignorance.

The circular also claims as "possible profits from Nova Scotia mines (Neily's mines, remember) per year $936,000" or about 50 per cent. more than our gross output last year. All his Nova Scotia mines have since been closed and bills for labor and supplies are unpaid.

When the Copper Crown Mining Company's dreams at New Annam began to fade and their "Smelter" at Pictou would not even smelt, the cargo of genuine copper ore bought in Newfoundland, the promotors secured some gold areas at Mills Village, Queens County, sunk a shaft, struck a small pocket of rich specimens, took them and scooted back to Boston, organized a million dollar stock company, called it the Gold Eagle Mining Company, Office, Room 74-373 Washington St., Boston, printed circulars showing up their property in iridescent hues and from one of those circulars I make extracts:—

"A 20 stamp mill will crush about 40 tons per 24 hours of this rock which will average at least 2½ ounces of gold per ton, value $50.00, making $2,000 gross daily.

The maximum expense will not exceed $100, leaving $1,900 or $47,500 per month.

Wheu iucreased to 200 tons per day will yield a net profit of $237,500 monthly or $2,850,000 annually.

Two thirds of the profits will be available for dividends (payable monthly), the balance will be reserved for a working surplus."

With an euphonious regard for the eternal fitness of things this advertisement in a recent number of a New Bedford paper:

"DIVIDEND PAID.

"The first quarterly dividend of the Gold Eagle Mining Co. will be paid through the office of H. F. Babcock, 218 Fourth st., New Bedford, Mass., April 1st, 1901, to all stockholders in this sectiou."

This Copper Crown—Gold Eagle combine have sold many thousands of shares of Gold Eagle stock to victims in New Bedford, Brockton and other industrial cities in Massachusetts, at from par to $2.00 per share, and now they propose to pay a dividend in order to bolster up a desperate effort to dispose of another larger block of Gold Eagle stock before the crash comes.

What have been their mining operations? Briefly these: On their property a rattle trap 10 stamp mill has been erected, fitted up with obsolete machinery which had been rusting on Molega Barrens for 12 years.

A short time since a sworn return was made at the Mines Office from the Gold Eagle mine for their mill work and returns since commencing crushing last October, and they are, 435 tons of ore crushed and 318 ounces of gold extracted.

Now I am in position to state that from 1,500 to 2,000 tons of ore were crushed, and it was poor mill work at that. Where is their $50 ore and where do the dividends come from?

Not content with these operations the same gentry are now operating in the Leipsigate District, and are out with "Facts and Figures worth reading" about the "Black Hawk Mining Company," which is "Located on the Mother Lode (!!) of Nova Scotia, nine miles from Bridgewater," and where "there is now according to measurement upwards of 60,000 tons of milling rock, blocked out, with assay value from $20 to $50 per ton in vein No. 1."

I will stake my reputation that all the mines in that district have not 6,000 tons of ore blocked out; and yet these men are buying large space in the Boston *Sunday Herald* and offering their stock at par on a capitalization of $1,000,000.

Such operations as I have described do untold harm to the legitimate mining industry. I believe in the future of each of the districts I have mentioned, but not iu such flim-flam games as I have described.

NEED OF A GOVERNMENT ASSAY OFFICE.

And here are arguments for a creation of a Government Assay Office with a department for the collection and dissemination of reliable statistics and information as to our metalliferous resources.

Nova Scotia reserves of coal iron and gold, in my belief, offer attractions to investors, second to no other portion of the mining world. All the adjuncts necessary to the mining man are always at his door. No country offers more generous and equitable laws to the miner. Life and property rest in unrivalled security. The earth does not know a more hospitable people.

In my loyalty to these great mining resources lie my apologies for taking so much of your time to-day. (Applause.)

VOTE OF THANKS TO PRESIDENT.

Mr. F. H. MASON proposed a vote of thanks to the President for his admirable address.

Mr. Mason's motion was cordially seconded by Mr. Fergie.

THE PRESIDENT:—Your words of appreciation are very agreeable to me. The fact that the public has been often victimized in the past and is being victimized to-day, is the reason why I have written so strongly on a subject on which I feel strongly.

FINANCIAL STATEMENT.

THE SECRETARY read the financial statement for the past year. Also a statement of the receipts and expenditure in relation to the reception of the American Institute of Mining Engineers in August last, all having been audited.

On motion of Mr. Stuart, seconded by Mr. Fergie, the reports were received and adopted.

Mr. McNEIL referred to the matter of comparisons of output, stated that a recent issue the CANADIAN MINING REVIEW published a statement which did us an injustice, inasmuch as it coupled the output of this Province with the other Maritime Provinces.

[EDITORIAL NOTE:—The item referred to is a very brief summary of what was a very exhaustive review of the mineral industries of the Dominion during 1900, presented by Mr. Bell, Secretary of the Canadian Mining Institute. When this paper is printed it will be found to do full justice to the remarkable expansion of mineral development in Nova Scotia.]

Mr. STUART:—I think it unfair that Nova Scotia producing from 95 to 98 per cent. of the mineral products of the three Maritime Provinces should be coupled with the other two Provinces. As a matter of fact Prince Edward Island produces no minerals, and we should have the credit of the entire $11,000,000 output credited to "Maritime Provinces."

Mr. FERGIE:—I think, Mr. President, that we only want to draw Mr. Bell's attention to the fact that we do not care to be coupled in that way with the other two Maritime Provinces.

THE PRESIDENT:—I am sure that if Mr. Wylde will call Mr. Bell's attention to the apparent injustice of coupling us with the other Provinces he would be only too glad to rectify it.

Mr. FERGIE:—I would move that such a committee consisting of the President, Mr. Poole and Mr. McNeil wait upon the Premier in regard to advertising the mineral resources of the Province.

Mr. POOLE:—I would suggest that the President and such members as he might name be the committee. On behalf of our coal mines I would also like to refer to another matter. The Premier has interested himself and his Government in the importation of horse flesh suitable for certain purposes. Our coal mines are more and more in want every year of a breed of horses, short in the legs and stocky, and I think the suggestion might be made and Mr. Murray asked to bring the services of veterinarys to bear upon the importation of a breed of horses which would be suitable for this class of work.

Mr. BROWN:—The tendency is for the breed that the mines require of little hardy ponies to get scarcer all the time. The farmers as a rule will not keep two kinds of horses.

THE PRESIDENT:—It is then proposed that the committee interview Mr. Murray as to the necessity of more information as to our gold fields being distributed, or rather the more frequent and continued advertising of Nova Scotia's resources, both of gold and coal.

Mr. GREEN:—At the present time there is in preparation the Exhibition prize-list. It might be a profitable source of advertising. A page or two of such matter would go very well in that prize-list, which has a circulation of 7,000 copies.

Mr. McNEIL:—In connection with that, should not this Society take some interest in the Exhibition, with a view to getting a better mining exhibit? Last year a gentleman wanted to exhibit gold ores, but because there was not a general exhibit of gold ores it was declined. At any rate he did not exhibit them.

THE PRESIDENT:—There is in existence somewhere a collection of our ores which was sent to the Paris Exposition.

Mr. McNEIL:—That collection is now in Glasgow and will be there a year; and it is to go to the museum after it comes back. It strikes me that some year we might make a special effort to make a mineral exhibit a feature of the Exhibition. This might be a good year in view of the fact that there are so many new mines, which are always more or less anxious to exhibit.

Mr. FERGIE: It is a matter of difficulty to get a good exhibit together.

THE PRESIDENT: I am in hopes that Mr. Fairbault will not cease his work until he gets down in the district I am operating in and give us a survey there.

I think the motion before the house now is to appoint the President with discretion to name his co-adjutators to interview the Premier in regard to the various points we have been discussing.

The motion having been put was carried.

THE PRESIDENT: I would like very much to have the assistance of Mr. Poole, Mr. Hayward and Mr. McNeil. There are other gentlemen who would be very valuable, but I suggest these three gentlemen because they are so immediately available, being resident in or near the city. This is a matter I take a personal interest in, and probably within the course of three or four weeks we can arrange a meeting.

WORK OF THE GEOLOGICAL SURVEY.

Mr. STUART: I have been gathering some information in regard to the work in the Geological Survey Department at Ottawa. There has been a good deal of complaint for the last 10 years in regard to the work which has been done by Mr. Fairbault and Mr. Fletcher, in that some of their maps and reports have not been issued. Possibly the department is in a position to satisfy us that there has been no intentional discrimination. I do not want it understood that anything I say is intended to reflect on the department at Ottawa. I have some notes here which I have prepared with some little care.

At the present time there are ten maps of Nova Scotia which have been surveyed for over ten years and engraved for publication, but which have been for some reason withheld from the public.

All the country as far west as Windsor has been surveyed, but the compilation of the maps, over 20 in number, has been delayed, said to be on account of insufficient help in the office. The result is that some 30 maps surveyed from 5 to 10 years ago have not yet reached the eyes of the public, and we are therefore receiving no benefit from the labors of these efficient and hard working members of the Geological survey department.

Much of the work referred to has been done by Mr. Hugh Fletcher, which is a sufficient guarantee of its correctness.

Why this work of the past decade of this most competent official of the department should be kept "under a bushel" is a mystery that should be solved at once.

I would like also to ask why there has not been issued a general report on the Geology of the gold fields of Eastern Nova Scotia? Mr. Fairbault has gone over all this ground in the most thorough manner, and while a number of maps have been issued, there has been no report. It is now some ten years or more since this work was begun. I notice there is no such delay in giving the public the full benefit of the work done in Ontario and in the West by the Geological department.

In conclusion I would move this resolution;

"*Resolved*, that this Society desires to call the attention of the Federal Government to the large number of Geological maps of Nova Scotia, both of the Gold and Coal series, that have been prepared for many years but are still unprinted;

That the delay seems unfair to the mining industry not only of this Province but of the Dominion. We would therefore respectfully urge a speedy consideration of this important matter.

At the same time, this Society further desires to say they would be gratified should it please the Ministry to appoint Dr. Bell, the past assistant director, now acting director, to the position of Director of the Geological Survey."

Mr. FERGIE: There is one part I think we had better leave alone. I think we made a mistake in Montreal last month in making any suggestion about who should succeed Dr. Dawson, and I think this Society should leave it alone.

Mr. POOLE agreed with Mr. Fergie in thinking the Institute made a mistake.

Mr. STUART: That was really the reason I referred to it in my resolution, because I found there were a number present at that meeting in Montreal who have since felt a mistake was made. Some of them have expressed themselves to that effect. I think perhaps a mild suggestion from this Society might have a good effect.

Mr. HAYWARD: Do I understand that the action taken in Montreal will be presented to the Government?

Mr. FERGIE: It has been presented.

Mr. HAYWARD: Then I would think it advisable to put ourselves on record as against their recommendation. If we have a different opinion from that of the Canadian Mining Institute then we should express it.

Mr. FERGIE: We might put it in such a way that while we do not wish to dictate, still the most careful consideration should be given and the best and most practical man appointed.

The PRESIDENT: I do not see that the Canadian Mining Institute could take any offence if we passed this resolution.

Mr. POOLE said our interests were not quite the same.

Mr. STUART: I have every reason to believe that Dr. Bell is in sympathy with Nova Scotia. At least he has no preference for the West over Nova Scotia.

Mr. HAYWARD : I quite agree with Mr. Fergie that some of the members of the other society see their mistake in passing that resolution, and I second Mr. Stuart's resolutiou.

Mr. F. H. MASON : I think perhaps before you put the resolution, Mr. President, it might be well to add that a copy be sent to the Government. It would be of little use unless it is sent at once.

The PRESIDENT : I think it would be sufficient if we instructed the Secretary to at once mail a copy of the resolution to the Minister of the Interior.

The resolution having been put, was carried unanimously.

The PRESIDENT : Mr. Poole has made a suggestion that we should go in a body to the Provincial Museum aud see it. We are interested in that museum, and we are recoguised by the Government as having rights there, and I think it would be a good idea to make an official visit.

I may add that Mr. Poole has very kindly requested us to pay a visit this afternoan at five o'clock to his house, and "handsel" the few pieces of plate presented to him on his retiring from rhe management of the mines of the Acadia Coal Company.

ELECTION OF OFFICERS.

The PRESIDENT : Our next business will be the election of officers for the ensuing year.

Mr. MASON : I would move that the following gentlemen be elected the officers of the Society for next year :

President—W. L. Libbey.
First Vice-President—George W. Stuart.
Second Ditto —A. A. Hayward.
Third Ditto —Alex. McNeil.
Secretary—H. M. Wylde.
Auditor—J. H. Austin.
Council—B. C. Wilson, M. R. Morrow, Charles Archibald, J. G. McNulty, B. F. Pearson, J. G. Rutherford, J. H. Austen, Frederick Taylor, F. H. Mason.

Mr. Mason's motion having been seconded, on motion the ballot was dispensed with, and the above named gentlemen were elected to the respective offices named.

The SECRETARY : I beg to give notice of motion to change the date of the annual meeting to the first Wednesday in February, instead of the present date. By having our meeting then we can appoint our committees, and if we have to wait on the Government in connection with any matters we can do so before the House meets.

Mr. STUART called attention to a notice of motion by J. Stevenson Brown at the meeting of the Canadian Mining Institute that the rebates to Provincial Societies be abolished, and moved that the Secretary be instructed to ask the Institute that the rebate be paid to the members of this Society entitled to same.

Mr. McNEIL seconded the motion, which was carried.

The SECRETARY also brought up the matter of refund due from the Intercolonial Railway on account of the excursion last August. He asked that a strong telegram be drafted and sent to Mr. Lyons this afternoon.

On motion the Secretary was authorized to send such a telegram to the Railway Department at Moncton.

The morning session then adjourned.

AFTERNOON SESSION.

Having visited the Provincial Museum as arranged, the Society resumed its deliberations at 3 p.m.

THE PRESIDENT : The next thing will be the reading of a paper by Mr. George W. Stuart, which I think will be of great interest to all of us.

A PLEA FOR A GOVERNMENT ASSAY OFFICE.

Mr. GEORGE W. STUART : For many years past I have realized the necessity of a Government Assay Establishment, and at a meeting of this Society some four years since, I suggested the formation of such an institution, for the assaying of gold bullion produced in this Province. The benefits derivable from such an institution must be apparent to every one, whether interested in mines or not : and to the metalliferous miner, particularly, the advantages must be admitted to be manifold. I am fully convinced that the advantages of such an institution as I am proposing will not be confined to the mining community, but will be far reaching, benefitting the whole Province and largely increasing the Provincial revenue.

Our Provincial mining laws, as you are aware, provide for the returns to the Government of all gold and other metals and minerals mined : therefore the public, wherever these reports are read or quoted, are led to believe this Blue Book, issued by the Mines Department, shows the whole product of the Province ; when, as a matter of fact, large quantities of the gold taken from our mines are not returned at all, and the Government gets no account of it ; therefore not only is the Government defrauded, bnt the public are deceived, and the mine, in many instances, discredited. There are several causes for this shortage in the gold returns of this Province, and they are about as follows :—1st. The miner who steals the nuggets from his employer finds an illegitimate purchaser, who pays him any price he chooses for his ill gotten gold ; neither of these thieves make any returns. 2nd. Dishonest majority mine owners ship and sell much of their gold without making any returns of it, in order to defraud minority owners ; and by so doing rob the Government, as well, of the royalty. 3rd. The dishonest tribute lease holder also makes returns of less gold than he obtains, in order to save both the percentage due to the owner of the mine, and to rob the Government of their "pound of flesh" as well ; and the 4th. Class make returns of much less gold than they obtain, simply to save paying the 2 per cent. royalty.

From all these causes the Government lose a large amount of royalty, and the Province is credited with much less gold than she actually produces, and yet the *whole of the ore tonnage* is returned, thus causing the average yield per ton to appear much lower than it is entitled, this to the general disparagement of the industry.

These are all serious evils you will admit, and I think, at least every gold mining man here will admit they all exist.

Will the establishment of a Government Assay Office, which shall become a part of the Govermental machinery, cure these existing evils?

After giving the question, for years, the most careful consideration, I am fully convinced in the affirmative. I shall not attempt here to go into all the details necessary with the working of this suggested new department for the mines regulations, nor to forecast the probable full results from the working thereof.

On the establishment of such an office, several new clauses would be required to be added to the Mines Act. 1st. Making it compulsory for all gold to be sent to the Government Assay Office, where it will be assayed, weighed and stamped. 2nd. All gold, smelted or unsmelted, found in the possession of any person not a mine owner, or an unauthorized mine—express—or bank agent, and in course of transit to the Government Assay Office, to be confiscated and to become the property of the Government, unless such gold as has been found to have been stolen, in such cases, it shall be returned to its rightful owner.

The duties of the Government Assayer should be to resmelt and assay, or assay without resmelting, as he thinks necessary, all gold bullion produced in the Province. I say resmelt, if he thinks it necessary, this, in order to insure a perfectly homogenous ingot ; and also for the purpose of detecting fake ingots, by which, I mean, an ingot with a base metal core, encased in gold. On several occasions such frauds have been practised in this Province.

When the assayer has determined the fineness and the weight of each ingot, he shall stamp the same thereon with the Government dies, both the weight and the quality, and he shall keep a record in the office of the same, and the mine from which it came, as well as the tonnage of the ore or concentrates, or gravels, as the case may be, from which it was produced, it being compulsory that such a sworn report shall accompany the gold to the office ; and this shall be all the returns incumbent upon the owner to make to the Government. The royalties collectable on all gold might be paid at this office.

The maximum charge for such duties of the Government Assayer should not exceed 50 c. per lot of gold.

The next important duty of the Government Assayer, and the one from which we should expect perhaps even more beneficial general results, is that of the examination and assaying of ores and minerals at a nominal charge. These duties I should outline about as follows : 1st. To examine and give his opinion as to the nature and value of any sample of mineral taken to him and to say whether he considers it worth assaying, this duty to be free of charge to any *bana fide* resident of Nova Scotia.

2nd. To make for any bona fide resident of the Province a quantitative determination of any metal in any sample of mineral at a cost of say 50c. per metal or metaloid, thus, for example, the cost of a gold assay would be 50 cents and an assay for Gold and C pper 1.00, or the determination of iron or phosphorus, sulphur and silica in an iron ore $2.00 and so on.

I have named these nominal rates, and that discretionary powers be given the assayer as to what he shall consider to be sufficiently valuable to

warrant assaying, that such powers be given him and a small fee be charged I consider necessary, otherwise it is doubtful if he would be able to cope with the work that would be heaped upon him by worthless samples of rock sent in.

With a thoroughly competent man as chief in this office, (one in whom the public has confidence), miners, prospectors, and others interested in our mineral development, would patronize it, and with such a patronage, who can foretell the possibilities arising therefrom. Apart from British Columbia *none of the other provinces offer such inducements or possibilities as Nova Scotia.*

Now what are our sister Provinces doing in this line of advancement? Ontario established a Provincial Assay Office, at Belleville, some four years ago. At first assays were made entirely free. The office became so crowded with so many useless samples, assays of which were demanded, that a nominal charge had to be made, and diagnosis of minerals were made free, while in the latter part of last year a charge of 10c. was made for these examinations. The Assay Office, which was started in a small way, now consists of two flats of six rooms. Cabinet specimens of minerals from all over the Province are kept, each mineral being properly labelled, and pulp and rock samples from all the developed mines are kept, and may be obtained by any one at certain charges.

During the past year 1641 determinations were made at an average cost to the public of 91c. per estimation, different rates being charged for different determinations, all fees being paid in advance; besides this, 304 diagnosis of minerals were made.

The Office has been instrumental in the discovery of platinum in the Province in the form of sperrylite and arsenide of platinum. In the discovery of large deposits of mispickel, and in the revival of the manufacture of white aresenic. It has been of incalculable service to the prospector for iron ores, in determining titaniferous from non-titaniferous ores.

British Columbia has a well equipped Government Assay Department at Victoria, where last year a very large number of assays for the public were made, besides a considerable amount of work was done for the Department of Mines, including the smelting and assaying of $219.033 worth of gold. Besides this office, operated entirely by the Government at Victoria, and at Vancouver, the Government subsidizes liberally the establishment owned and operated by Mr. Pellew Harvey; a large amount of work was done in this office also. The results of the work done in these offices—the one entirely conducted by Government and the other subsidized, has been of great value and importance to the public and the Government, as they have been the means of locating many Gold and Silver Mines, and the discovery of payable quantities of platinum in the black sands of the Fraser River, also of the discovery of gold associated with tellurium in a number of districts.

I need not refer at greater length to the results achieved by these establishments in the other Provinces referred to. With such facts before us, can there be any question as to the duties of our Provincial Government, in either establishing an office conducted entirely by the Government Officials, it becoming a part of the Governmental machinery, or subsidizing an office now established, or to be established.

Should the Government adopt such a plan as I suggest, it would, I believe, practically do away entirely with the illicit gold buyer, who would be subject to a search warrant at all times, and all the gold found in his possession taken from him. No Bank, Broker, Jeweller or other person dare buy any gold unless the Government Stamp were upon it.

It would be better for the small prospector and tributor who brings in small lots of gold of from 1 to 10 ounces, and often has to dispose of it at from $2.00 to $4.00 per ounce less than its value, whereas with such an office as suggested, he would receive full value for it, for after the Government stamp were on it anyone would buy it at face value.

With regard to assisting the prospector, I believe cheap assaying, of incalculable value and help in the development of the mineral resources of the Province. Even at the present prices of assaying, with the limited number who can afford to take advantage of it, it has been the means of bringing to light a new gold field of very considerable promise, at Chetticamp, in Cape Breton—a vein of hubrenite containing the valuable metal tungstan at Margaree. It has proved to us that some of our concentrates contain sufficient arsenic to at least go a long way toward paying for the extraction of the gold contained in them. It has been the means of bringing to light deposits of fire clay of considerable promise, and also of the discovery of gold in the antimony deposits at West Gore, County of Hants.

With the nominal charges such as I have suggested, who can estimate the results from the advantage that would be taken of it.

Why has not such an establishment been instituted long ere this by the Government in this oldest mining Province of the Dominion? Are we not to blame? Have we, as a mining society, been sufficiently vigilant, suggestive and aggressive in urging upon the Government the great necessity of such an institution? Applause.

The PRESIDENT: I hope that some of the members present interested in Mr. Stuart's ideas in a business way will give us some remarks. From my own point of view he has touched on a subject of very vital interest to gold miners in particular and the public in general. With a well organized or even imperfectly organized system of government control of the handling of gold, such a fiasco as we have had recently in connection with the illicit selling of gold would hardly be possible.

Mr. McNEIL: The point which, perhaps, interested me more than any other was that at the end of the paper in which the question was asked, "Have we as a Society, done our duty in urging the Government to establish an assay office?" I have no hesitation in saying we have not done our duty, and that we might have done more and we should have done more in impressing its importance upon the Government. Its importance is not merely conceded by other provinces. and is not merely proved by the experience of other Provinces, but I think every intelligent man in the mining business knows it is not only important but it is one of the necessities for a speedy development and progress of the mining industry.

One of the points that might be made as to the value of this assay office would be the work of the laboratory of the Dominion Coal Company. That laboratory has added many thousands of dollars to the revenues of this province, and has done more for the extension of the coal markets of Nova Scotia than any other work that has been carried on. I leave other coal men to speak who are more experienced, but I do believe that to the laboratory of the Dominion Coal Company is due a realization of many of the various new and important uses to which our coal may be put. It is probable that the work of carrying on investigations along that line has only just begun, and that it could and should be carried out by means of the Government, which is so deeply interested in the matter of revenues and the general prosperity of the Province. I am sure that that work, if carried on, will still further expand our coal markets, to the great advantage of the Province. And so with gold. We have seen the experience recently of a large gold mine where ample capital was brought in from outside and where that capital was wasted, and I would add, wasted for want of proper information, part of which, at least, would be supplied by a properly equipped and properly operated assay office.

The matters referred to in the able paper of Mr. Stuart strike at the point where the work should be carried on. The work should be carried on so that it would enable miners to take up the treatment of gold bearing ores. The Society owes a debt of gratitude to Mr. Stuart for his valuable paper.

But the point is, how are we going to bring about this desirable object? What should we do as a Society—what work can we do, in order that it shall be brought about? If you refer to the discussion that took place during the late session of the House, you will find that the government was asked if it was their intention to establish an assay office, and that in reply the Premier said: "An assay office was something the government had not lost sight of. He had no doubt at some time not far distant we would have a well equipped assay office." Now, gentlemen, we should help the government to interpret those words, "not far distant," and we should make that not far distant mean a very short time indeed in plain English, and if we wish to do that I would suggest that this paper of Mr. Stuart's be sent to every member of the government and every member of the legislature, and I have no doubt that as a result we shall find a vote for an assay office in the estimates for the next session. (Applause).

Mr. FERGIE: I did not hear the paper read, but I had the pleasure of scanning it on the train last evening while coming to the city, and I fully indorse everything the writer has said, and also what Mr. McNeil said about furnishing a copy to every member of the government as soon as possible. The sooner the matter is taken up and forced to their attention the better.

I did not quite follow Mr. McNeil, if he will pardon me, when he said that the Dominion Coal Company's laboratory had done more than any other factor in the extension of our coal markets.

Mr. McNEIL: In extending the coal to new uses was the impression I wished to convey. I believe the experiments carried on in that laboratory with regard to the recovering of by-products from the coal resulted in the establishment of the great coke and gas works at Everett, Massachusetts, to which about 600,000 tons of our coal were shipped last year.

Mr. FERGIE: I would take it then that the laboratory was at Everett.

Mr. McNEIL: Their laboratory in Cape Breton I am instructed is a very well equipped one. I maintain that their most valuable information came about in that way."

To be continued.

COMPANY NOTES.

Athabasca Gold Mine Ltd.—From the annual report for the year ending 31st December last, we are informed:—"The produce for the year reached the figures $170,663.96, which sum was obtained from 5,054 tons of ore. In the statement of cost the entire amount expended in development (which was $29,014.48) is included in the cost of mining, and only the actual cost of new machinery, erection and buildings is included in item of "new construction." After making these charges, and adding to the produce the profits derived from sales of merchandise and other sources, the profit for the year on operation was $29,551.19. The vein has continued to present difficulties which have rendered the cost of mining high; it has been broken by faults, it has lain flat and its width has been about the same as during the previous year. For every ton of ore about four and three-fifths tons of waste have been mined, and a further amount of waste (which I am not able to estimate), has been mined and left in the worked out stopes. Under these conditions, and, although every effort has been made to conduct the work on economical lines the cost per ton is high.

Mond Nickel Company.—Among our illustrations this month we show a number of views of the new plant of the Mond Nickel Company at Whitefish, Ont. The mine is developed by a shaft 200 feet deep with three compartments. There are three working levels and six stopes. The mine is equipped with air drills, hoist, etc., for 400 feet. A Bleichert wire rope tram of 25 tons capacity per hour connects the Rock-house with the Roast yard and Smelter. The Smelter consists of two blast furnaces 44 in. by 120 in. of a capacity of 150 tons each for 24 hours. Two converters stands with four shells and a travelling crane and a relining machine. Power is supplied by a tandem compound condensing engine to blowers and electric generator. A blowing engine for converters, &c.

Bruce Copper Mines.—We publish one or two photos from Mr. Braden showing progress of construction of plant at Bruce mines. In a recent letter Mr. Braden says:—"We started with this work in October, and most of it was done during very severe fall and early winter weather, but we are in good shape now. Construction work at the mine is completed, and also, practically, at the mill, which is about a mile eastwardly from the main working shaft at the present time, though the old vein workings pass along about three or four hundred feet back of the mill. The mill is supplied from the lake with water by a compound reciprocating pump; a standard gauge tramway connects the mine with the mill. We feel that we have accomplished quite a little in a short space of time, as we were handicapped considerably both as to material and labor. Many of our heavier timbers had to be built up from two and three inch plank. As a matter of interest to you in connection with the boarding-house, I would say that this building is electric lighted, steam heated with radiators in all of the mens' rooms and running water in all of the rooms, besides hot and cold shower-baths. It is also supplied with a large reading and sitting room. I think it is a very good idea as we will be able to get a particularly good set of men, or at least I think we will as time goes on, though up to date I must say that the miners of Ontario are of a very inferior grade to what we get in the North-West."

Canadian Gold Fields Syndicate, Ltd.—Director's report for last year says: "One year ago, our Company owned the Sunset group at Rossland, on which a large amount had been expended in equipment and development; the "Jennie" silver-lead mineral claim, in the Slocan; six hundred and forty thousand shares of the stock of the St. Eugene Consolidated Mining Company, Ltd., and had $4,633.27 cash on hand with which to carry on operations.

January, 1901, found us in a greatly improved position.

The St. Eugene Consolidated Mining Company, Ltd., has entered the list of dividend payers, and has declared and paid a dividend of one hundred and five thousand dollars, for the quarter ending December 31st, 1900. This amounted to three per cent. on its capitalization, our share of the dividend being $19,200.00. At the end of 1900, the issued capital of our Company was $600,000.00, leaving shares of the par value of $400,000.00 still unissued in the treasury of the Company. In November last, the Board of Directors declared a first quarterly dividend of three per cent. on the issued capital stock of our company, being at the rate of twelve per cent. per annum on the par value of the shares. This dividend has been declared and paid.

In addition to the assets enumerated above, the Canadian Gold Field's Syndicate, Ltd., have acquired other valuable assets during the past year. Negotiations begun in the early spring for the acquiring of the Sunset silver-lead property, in the Slocan, and the controlling interest in the Commonwealth group of mines, near Crawford Bay, on the east side of Kootenay Lake, B.C., were delayed for over three months, owing to my serious illness. In the month of June last, the "Sunset" property near Whitewater, B.C., on the line of the Kaslo and Slocan Railway, was taken on a bond, for $30.000.00, the bond to run until June 1st, 1901, without any cash payment in the interval, but stipulating for continuous work on the property by at least four men. Mr. W. H. Jeffery, the Company's Mining Engineer, reported strongly in favor of taking a bond on this property, and he was put in charge of its development. His report to the Directors gives details of the work done and results attained.

In August last a bargain was made with the owners of the Commonwealth group of mines for the acquiring of a substantial interest in those properties. A new company has been incorporated under the Laws of British Columbia, known as "The Commonwealth Mines, Limited," with a capitalization of 1,500,000 shares of the par value of one dollar each. Of this amount, one million shares were placed in the treasury of the Company, the owners of the property receiving five hundred thousand shares in full payment for the group, which consists of three full claims and two fractions. The Canadian Gold Fields Syndicate, Ltd., have acquired four hundred thousand shares of the stock of the Commonwealth Mines, Ltd.; five thousand dollars has been placed in the treasury to be expended on the property.

The claims are all Crown granted and titles perfect. Development work was resumed on these properties in September last and continued until late in November, with very gratifying results. Work will be resumed early in the spring and pushed vigorously during the year. Already a large body of high grade ore has been opened up, and I have no hesitation in saying that the Commonwealth group gives every promise of making one of the big paying mines of British Columbia.

About the first of November last, a bargain was made with the owners of the True Blue group of copper mines, near Kaslo, B.C., whereby the Canadian Gold Fields Syndicate, Ltd., acquired the controlling interest in those properties. A Company has been incorporated under the laws of British Columbia, known as "The True Blue Copper Mines, Limited," with a capitalization of 1,500,000 shares of the par value of ten cents each; of this amount, 800,000 shares were placed in the treasury of the Company, and the owners of the property received six hundred thousand shares in full payment therefor. The Canadian Gold Fields Syndicate, Ltd. have acquired four hundred thousand shares of the stock; the sum of five thousand dollars has been placed in the treasury to be expended in the incorporation of the Company and the development of the property. A large amount of development work has already been done on the True Blue group, disclosing a good sized chute of high grade copper ore. Two car loads of this ore were shipped by the former owners to the Hall Mines Smelter, at Nelson, B.C., the smelter returns being 10.4 per cent. copper and 12 1 per cent. copper per ton for the respective carloads. This was very high grade ore, and our Mining Engineer has every confidence that the True Blue group will be speedily developed into a regular shipping mine.

In addition to the above valuable assets, the Canadian Gold Fields Syndicate, Ltd., on the first day of January, 1901, had $22,845.28 cash on hand, and amounts accruing due on stock and bills receivable to the extent of $8,100.00, making $31,945.28 available for the carrying on of the operations of this company.

In April last I recommended the suspending of operations at the "Sunset No. 2" group at Rossland. This was done, because the results of development work had not been up to our expectations and because it was felt that our funds could then be more profitably employed in other fields. Permit me to say, however, the suspension of work on the "Sunset No. 2" group by no means lessens my faith in that property. I shall expect to see that property developed into a paying mine, and am looking forward to see the time when operations will again be resumed on our Rossland property.

A word or two regarding the St. Eugene Consolidated, in which the Canadian Gold Fields Syndicate, Ltd., are so largely interested, may not be out of place here.

The St. Eugene Consolidated is now equipped with a concentrating mill of a daily capacity of four hundred tons, being double the size of any other concentrating mill in Canada. The property is so well developed that there is now considerably over two years' ore supply blocked out, in sight, and new ore reserves are being steadily developed. The St. Eugene Consolidated is now shipping from 2,500 to 3,000 tons of silver-lead concentrates per month, and besides earning and paying a dividend of three per cent. per quarter, has a large cash surplus on hand.

At the present market price of the St. Eugene Consolidated shares, our holdings in that company are worth more than the total issued capital of the Canadian Gold Fields Syndicate, Limited. This fact, taken in connection with our other large and valuable assets, shows the strong financial position of our company.

Anglo-Canadian Gold Estates.—Annual General Meeting held London March 26. On Elizabeth claim in Seine River District outcrop averages about 6 feet in width with an average value of about $20 per ton. Development on this claim, which is only one of the Company's holdings, consists of shafts down 92 feet, with a level at 80 feet, in north 22 feet, south 44 feet. South drift is in ore which is estimated will yield about $7 per ton free gold. Total amount development is 250 feet, but contracts have already been let for 420 feet more. A Bullock Diamond Drill is used for prospecting. One bore hole has already encountered vein at depth of 200 feet, the ore here is 4 feet wide and assays $37. According to Mr. Alan Sullivan, General Manager, cost per foot of diamond drilling is only $125, certainly a very low figure for the formation passed through—granite and schist. The drill is worked by a force of six men in three shifts of eight hours each. The Company is making provision for erection of stamp mill soon as Canadian Northern Railway, now building, reaches the location.

Bullion.—This American Company owning location 263p 3 miles east Rat Portage has let contract for 300 feet shaft 8x8 in the clear. The coming season promises to see a revival of former activity in this section as at least two other Companies owning locations there are preparing to begin operations almost immediately.

Granite Gold.—This English Company is about to be wound up so it seems. It was floated in 1899 with every prospect of a successful future. At the Annual Meeting four months ago every assurance was given that everything was right. The Duncan Mines Ltd. (the vendors) and the Bank of Montreal were the only creditors, the latter institution to the extent of about $14,000, certainly not a large sum. The impending collapse, if collapse it is to be, is due to differences between the vendors, who accepted shares in payment, and the present Company. A writ for $100,000 was served on the Company by the vendors, and that it seems gave reason for the proposed liquidation. It is to be hoped that the differences between the two Companies will be amicably settled for otherwise what holds out every hope of proving a profitable undertaking will simply be added to the list of good Canadian properties gone wrong through no fault of the mine, the ore or the values.

Molly Gibson.—Latest information states that contract has been let for the further extention of No. 5 Tunnel 200 feet. This work is to be undertaken at once and continued in double shifts. Reports by two engineers state that at a conservative estimate the amount of ore in sight amounts to $400,000, which at present cost of extraction, shipping and smelting should net at least $150,000. They further state that if No. 5 Tunnel taps the same ore bodies as found in Nos 1, 2, 3 and 4 Tunnels (of which there seems to be no doubt) the amount of ore then exposed should amount to fully $1,000,000. They have accordingly recommended the Company to defer settle-

ment of question of best method of treatment until No. 5 Tunnel has tapped the ore bodies. It would be, in their opinion, impossible to state at the present whether a concentrator or a smelter would be the better suited to the economical treatment of the ore. If concentrator should be decided upon an electric tram line would be constructed over the Company's graded wagon road to connect lower terminal of aerial tramway and the Company's wharf on Kootenay Lake, a distance of 7 miles. A water power has been secured from which power for concentrator or smelter and also for tram line will be generated.

NEW COMPANIES.

The following are the recent incorporations of mining companies in the various provinces of Canada :

ONTARIO.

Golden Star Mining Co., Ltd.—Incorporated 16th January, 1901. Authorized capital, $1,500,000. Head office, Toronto, Ont.

Deer Trail Consolidated Mining Co.—Incorporated 7th Feb., 1901. Head office, Toronto, Ont. Secretary and attorney, Alex. M. Colquhoun, Toronto.

Grey and Bruce Oil and Gas Co., Ltd.—Incorporated 20th Feb., 1901. Authorized capital, $100,000. Head office, Hepworth P.O., Amabel, Ont.

Formosa Oil Company, Ltd.—Incorporated 28th February, 1901. Authorised capital $10,000. Head office, Formosa, Ont.

Sakoose Gold Mining Co., Ltd.—Incorporated 9th March, 1901. Authorized capital $300,000. Head office, Ottawa, Ont.

Imperial Corundum Company, Ltd.—Incorporated 13th March, 1901. Authorized capital $1,000,000. Head office, Toronto, Ont.

Westport Mining and Development Co., Ltd.—Incorporated 13th March, 1901. Authorized capital, $50,000. Head office, Westport, Ont.

Rush Bay Golden Horn Mining Co., Ltd.—Incorporated 18th March, 1901. Authorized capital, $250,000. Head office, Rat Portage, Ont.

London & Canadian Mining and Development Co., Ltd.—Incorporated 21st March, 1901. Authorized capital, $10,000. Head office, Brantford, Ont.

International Mica and Mining Co., of Ottawa, Ltd.—Incorporated 10th April, 1901. Authorized capital, $15,000. Head office, Ottawa, Ont.

Ottawa Mica Mining Co., Ltd.—Incorporated 12th April, 1901. Authorized capital, $100,000. Head office, Ottawa, Ont.

Honor Bright Gold Mining Co., of Ontario, Ltd.—Incorporated 17th April, 1901. Authorized capital $1,000,000. Head office, Berlin, Ont.

Desbarats Mining Co., Ltd.—Incorporated 23rd March, 1901. Authorized capital, $550,000. Head office, Desbarats, Ont.

BRITISH COLUMBIA.

True Blue Copper Mines, Ltd.—Incorporated 4th January, 1901. Authorized capital, $150,000. Mines office, True Blue Mountain, Ainsworth District, West Kootenay, B.C.

Carroll's Quesnelle River Leases, Ltd.—Incorporated 11th Feb., 1901. Authorized capital, £10,000. Head office, C. A. Holland, 40, Government street, Victoria, B.C.

Atlin Mining Company, Ltd.—Incorporated 13th February, 1901. Authorized capital, £75,000. Head office, R. G. Tatlow, Vancouver, B.C.

Bonanza Hydraulic Company, Ltd.—Incorporated 13th March, 1901. Authorized capital, $100,000.

British Columbia Pyrites Co., Ltd.—Incorporated 13th March, 1901. Authorized capital $50,000.

Thistle Gold Company, Ltd.—Incorporated 18th March, 1901. Authorized capital, $100,000.

Fisher Maiden Troy Mines, Ltd.—Incorporated 22nd March, 1901. Authorized capital $150,000.

White Mountain Mining Co., Ltd.—Incorporated 22nd March, 1901. Authorized capital $150,000.

NEW BRUNSWICK.

Golden Nugget Mining Co., Ltd.—Authorized capital $300,000. Head office, Fairville, St. John, New Brunswick.

Mica as an Insulator

It has been demonstrated that oil has a bad effect on the insulating property of mica. Mr. T. O. Maloney, in the *Electrical Review*, says that a piece of best Indian mics was placed between two planed surfaces, and withstood an insulation test of 16,000 volts alternating current without fracture. The current was then removed, and the surface of the mica lightly coated with paraffin surfaces. Under this condition it was fouud that it would break down at 9,000 volts alternating current. Another piece of Indian mica tested at lower voltages, and under the same conditions as above, was found to withstand 8,000 volts alternating, dry, and, when oil was applied, to break down at 4,000 volts alternating current. On the other hand, the surface of the mica can be coated with water and the insulation of the mica will not be lessened.

YMIR GOLD MINES, LIMITED.

The following is excerpted from the last annual report recently issued : "It is with much satisfaction that the Directors are able to refer to the fulfilment of the scheme for doubling the output of the Mine without having had recourse to any increase of the capital of the Company, the profits made having been more than sufficient to defray the whole of the expenses in connection therewith.

Owing principally to delays in the delivery of the material it was found impossible to have the new 40 stamp battery ready for operations until the latter end of June, and it was not for some two months later that the complete mill of 80 stamps was able to commence work.

Reference to Mr. Fowler's Report will show that the milling work done during the year was equal to 80 stamps working 216 days 10 hours, whereas the present full capacity of the mill, upon the basis of working 22 hours per day, is 55 per cent. more.

The accounts presented show that after writing off £5,606 12s. 3d. for development, depreciation, interest on loan raised for the new plant, and charging against the year's revenue the whole of the heavy administration and other charges consequent upon the additional machinery, etc., including extensive repairs to the old battery, a net profit of £30,928 5s. 7d. remains, which, added to the £10,030 18s. 9d. brought forward from the 1899 accounts, makes a total of £40,959 4s. 4d.

As the greater part of this profit has been re-invested in the mine it was not available for distribution, and consequently the balance is carrid forward, and an interim dividend of 1s. per share was declared at the end of January on account of the profits for the current year.

The carrying out of the important additions to the battery and mine, necessitated a complete reorganization of its working arrangements during the continuance of mining and milling operations, occasioning unavoidable delays, which not only increased the working expenses but reduced the output. Under these circumstances the Directors regard the result of last year's work with gratification.

At the end of the year the Ymir shaft had reached a depth of 258 feet below No. 3 level, or about 650 feet below the surface. Crosscuts were made at the 4th and 5th levels where the width and value of the vein has been proved to be well maintained. At this date also the 1,000 feet adit level had penetrated the hill 596 feet and is advancing at the rate of 125 feet per month, and should therefore reach the vein by the end of the current year, some four months before it is possible to work out the reserves above No. 3 level.

It will be observed that Mr. Fowler reports the vein above No. 3 level to be wider than he had originally calculated upon, thus increasing his estimate of the ore reserves.

Considerable time and attention has been devoted to the question of applying the cyanide process for the treatment of the mill tailings. Tests upon a fairly large scale have been made by Mr. Fowler and his assistant, Mr. Holden, with a satisfactory result, and a small plant for treating 10 tons daily should now be in operation.

ENGINEER'S REPORT.

Some interesting facts are brought out in Engineer Fowler's report from which we quote :—

The new battery of 40 stamps was put in operation a little before 1st July, but during June the whole mill was hung up for practically three weeks in order to connect the new and old parts and re-arrange shafting and various parts of the plant. During July and August the old battery was being extensively repaired, and during the latter month we suffered from an accident to the engine, at a time when the water for power was at a very low stage. Again in November the heavy countershaft through which the water and steam power systems join, was broken. All of these, together with other delays, such as are caused by freezing and accidents to the flume line, have made our mill record one not to be looked upon as an example of what we may hereafter expect.

The monthly crushings were as follows :

January	40 stamps	22 days 7 hours	2,160 tons.
February....	,,	23 ,, 0 ,,	2,263 ,,
March	,,	27 ,, 2 ,,	2,682 ,,
April.....	,,	29 ,, 2 ,,	3,000 ,,
May.....	,,	30 ,, 7½ ,,	2,990 ,,
June	,,	9 ,, 2½ ,,	892 ,,
July.....	80 stamps	23 ,, 19½ ,,	4,650 ,,
August.....	,,	20 ,, 9 ,,	4,100 ,,
September ..	,,	28 ,, 16¼ ,,	5,730 ,,
October.....	,,	29 ,, 3 ,,	5,630 ,,
November ...	,,	18 ,, 12 ,,	3,663 ,,
December....	,,	25 ,, 11½ ,,	4,900 ,,
Total....	80 stamps	216 days 10 hours	42,660 tons.

Average per 24 hours, 197.10 tons, or 2,464 tons per stamp per day, as compared with 2,483 tons during 1899. This difference against 1900 is principally, if not entirely, due to the increased hardness of the quartz.

The cost of mill operation during the year was 66 cents, and of repairs 24. making a total of 90 cents. As compared with 1899 (76¼ cents), the increase of 13¾ cents is due principally to repairs, and partly to the fact that 40 shoes and dies, supplied with the original mill, were not taken into account as supplies, but the actnal operating labour during 1900, including the share of extra cost incurred by running the steam plant, was three cents per ton less than in the preceding year. We confidently expect to show a cansiderable decrease for 1901.

Tramway.—The duplication of milling plant created the necessity of altering the wire tramway plant. This was effected by the introduction of

a better loading device, and the provision of larger buckets. Operation for the year shows a good saving, the cost being 7¾ cents per ton, while in 1899 it was 15½. This difference, however, is largely due to the greatly increased tonnage handled with a labour increase of only one-third. The total cost per ton during 1900 was 10.76 cents, and this amount includes the cost of two new cables, one of which proved to be of very poor material and had to be discarded after carrying about 20,000 tons. Had this not been the case the year's cost would have been reduced by three cents per ton.

General Expenses.—Under this head there has been an unavoidable and considerable increase, and the largest item is $4,281 for the British Columbia Government Mineral Tax on our output. This tax was formerly 1 per cent. and since July 1st, 1900, has been 2 per cent. of the value at the mine; and although our mining costs are as low as we think it possible to make them, the amount paid for the year is very nearly 2½ per cent of our operating profits, and since 1st July, on the present basis, we are actually taxed 3⅓ per cent. of our profits before allowing anything for depreciation or London expenses. Per ton of ore milled, this tax item amounts to 10 cents, and all other general, office, salaries and contingent charges to about 40 cents.

General Remarks.—It will be noted that we have shipped but a small amount of crude ore during the year, viz., 83 tons. This is owing to the fact that the ore body from which we shipped in 1899 (385 tons) has been exhausted, and it is seldom that we now find material in which the values are sufficiently concentrated to make it worth while sorting.

We expect to have our experimental cyanide plant, of ten tons daily capacity, in operation 1st February, and trust that the results will justify our advising the construction of plant to handle 150 tons or more.

During the year several cottages have been built for married employees at the mill, and these are bringing in a fair rental, while the accommodation and convenince afforded appear to be much appreciated by the occupants.

Beginning the new year, the rates for smelting our concentrate were increased by one dollar per ton, while the price paid for lead has been decreased by 30 cents per hundred pounds This means a decrease in returns of about $2.15 per ton of concentrate, and probably will amount to $10,000 less than would have been received under the rates which prevailed during the two years past.

PRODUCE OF THE MINE.

Milling ore stoped	41,643 tons.	Ore Milled	42,660 tons.
Milling ore from shaft.	1,339 "	Crude Ore	83 "
Crude Galena	83 "	On hand in Mine	322 "
Total	43,065 "	Total	43,065 "

QUANTITIES AND VALUE OF PRODUCT.

	Ozs.	Gold Ozs.	Silver Ozs.
Bullion	23,063	12,036.625	8,730.13
	Tons.		
Concentrate	2,950	3,327.830	36,717.23
Crude Ore	83	219.822	1,411.88
Totals		15,584.277	46,859.24
Average per ton	42.743	0 3646	1.096
" 1899	17.522	0.4812	1.425

	Lead lbs.	Gross Value.	Value P. T.
Bullion		‖ 254,098.80	† 5.9448
Concentrate	1,265,738	* 119,467.13	2.7950
Crude Ore	36,248	* 6,046.10	0.1415
Totals	1,301,985	$379,612.03	$8.8813
Average per ton	1.523%		8.8813
" 1899	1.863	$209,145.33	$11.94

‖ All gold at $20.67 per ounce; all silver at market price.
* 95% gold at $20.00 per ounce; 95% silver at market, 90% lead at M.
† Corresponding figures in last Annual Report were exclusive of express, freight and smelting charges.

AVERAGE RECOVERY FROM MILL FEED PER TON, FOR 1900 and 1899.

1900	Oz. Gold.	Oz. Silver.	% Lead.	Gross Value $
Bullion	0.2822	0.2046		5.9560
Concentrate	0.0780	0.8607	1.474	2.8004
Total	0.3602	1.0653	1.474	8.7564
1899				
Total	0.3965	0.8930	1.114	9.4607
Concentrate	0.0702	0.6680	1.114	2.5887
Bullion	0.3263	0.2250		6.8720

The former table very well illustrates the effect of the rich carbonate and galena ores shipped during 1899. The table of mill feed recoveries shows a net decrease of about 70 cents per ton; the decrease of bullion recovery of $0.916 having been partially offset by an increase in concentrate of $0.2117. The condition of the ore which partly accounts for this is further reflected in the statement that whereas, in 1899, 82.3 per cent. of the mill ore recovery of gold was in bullion, it was, during 1900, only 78 3 per cent. This percentage may of course still further be decreased as the volume of material treated from the lower levels increases; still it is expected that any increased degree of refractoriness will be more than compensated by our Cyaniding operations.

COSTS PER TON (42,743 TONS).

MINING.

	Labour.	Other charges.	Totals.
Stoping	$1.4483	$0.3561	$1.8043
*Development	0.2425	0.0570	0 2995
Repairs	0 0187	0 0143	0.0329
Totals	$1.7095	$0.4274	$2.1367

MILLING.

	Labour.	Other charges.	Totals.
Operation	$0.3670	$0.2930	$0.6600
Repairs	0.1823	0.0573	0.2396
Totals	$0.5493	$0.3503	$0.8996

TRAMWAY.

	Labour.	Other charges.	Totals.
Operation	$0 0767	$0.0010	$0.0777
Repairs	0.0096	$0.0202	$0.0299
Totals	$0.0863	$0.0212	$0.1076

* Other than No. 10 Adit and Ymir Shaft.

SACKING AND TRANSPORT TO YMIR STATION.

	Labour.	Other charges.	Totals.
	$0.0399	$0.1627	$0.2027
Express, Freight and Smelting			0.9901

OFFICE, ASSAYING, ETC.

Salaries	$0 1558
Telegrams and postage	0.0138
Assaying	0.0131
Office supplies	0.0073
Travelling	0.0278
	$0.2198

CONTINGENT.

Exchange	$0.0091
Insurance	0.0386
Legal charges	0.0031
Taxes	0.1002
General	0.1327
	$0.2837

SUMMARY.

	Amount.	Cost per ton.
Mining	$91,327 48	$2.1367
Milling	38,451 93	0.8996
Tramway	4,597 29	0.1076
Transport, &c	8,662 44	0.2027
Salaries and office	9,397 24	0.2198
Contingent and general	12,125 09	0.2837
Freight and smelting	42,319 04	0.9901
Total	$206,880 51	$4.8402
Total omitting freight and smelting		$3.8501

Comparison of these costs and the total of $3.85 per ton for all operating expenses, except smelting, with the figures given in our last annual report, whereiu the total cost per ton was shown to be $3 32, appears to manifest an increase of 53 cents per ton during 1900; but it must be remembered that the mining costs per ton of mill feed during 1899 were much reduced on account of our having had at that time over 5,000 tons of ore on the dump, the cost of producing which was partly incurred by the venders of the property, and partly was included in development. As a matter of fact, had all the ore which was milled in 1899, been stoped the total costs would have been almost exactly the same as in 1900.

On the whole, I am glad to say that the present condition of the property and plant is excellent; and that while there is always the possibility of geological disturbance below our lowest workings, there has been thus far little if any couse for anxiety as to the future, in this respect. The outlook therefore seems to be a very bright one, and the general situation one on which I think the Company is to be congratulated."

LAKE OF THE WOODS.

Sultana—This property is looking better than at any time in its history. The mill is now running 16 hours per day on rock from development. The management expects to start stoping May 1st. The mill will then run full time. The mine has reserves of ore in sight for three years for present mill of thirty stamps.

Pine Portage.—This mine, one of the oldest in the district, which has unfortunately been tied up for many years by litigation, has been purchased by Hamilton parties and will be reopened as soon as the Lake is open.

Champion.—Work will be resumed upon this property during the month.

Gold Panner.—This property, upon which is a ten-stamp mill, will resume operations on the opening of navigation.

Nino Mine.—The manager of this mine is expected back every day to resume operations on this property, which is regarded by the knowing ones as one of the best things in the Sturgeon Lake District.

Little Bobs.—This property, on Denmark Lake, is now under option for a large figure to a wealthy American, who will examine it on the opening of navigation.

The Golden Horn—An eastern company, composed mostly of Montreal capitalists, has taken over this property and will commence operations on the opening of navigation.

The Wendigo.—This property, upon which a good deal of development has been done, and from which over a thousand tons of ore were shipped to the Keewatin Reduction Works will be examined this month by John E. Hardman, the eminent mining engineer. A favourable report will mean the immediate resumption of operations.

Triggs Mine.—A reorganization of this company will be shortly completed. It is to be hoped that the new company will be able to secure competent management for their property.

Mikado.—This property is looking well. The mill is running full time, and sinking in two shafts goes on uninterruptedly with good ore in each. Another of the rich bunches for which No. 2 vein is famous was encountered last month. A half ton of this ore was put through the mill and produced $1000.

Eagle Lake.

Higbee Mine.—This property, which is being developed by Minnesota people, has a shaft down 70 ft, with a drift at the 50 ft. level measuring 100 ft from breast to heart. The vein varies from 2ft. 6in. to 6ft., lies between good walls, and often shows visible gold.

Baden Powell.—This prospect within the last few weeks has produced a large number of specimens of gold bearing quartz that will bear comparison with the richest specimens ever produced. A very fine collection has been sent to the Pan American Exhibition.

Sturgeon Lake.

A rush of prospectors is expected this summer to the new Eldorado. The Symes-Dawson are putting in a ten-stamp mill. The Shires locations will both be vigorously worked this season, and Mr. Steele will put in steel drills and open up his mammoth reef.

Seine River.

Golden Star.—It is expected that this property will resume operations as soon as the weather permits.

Olive.—This property will resume as soon as navigation opens so that a new boiler which is now in Winnipeg can be added to the battery at the mine.

An exceptionally fine showing of the ores of Western Ontario will be made at the Pan American Exhibition. A good deal of interest has been taken by people in this district, and visitors to the great fair will see an exhibit of ores that will compare favourably with those from other countries, and an exhibit of which Canadians will be proud.

Manitou.

The Big Master is working a full crew of men, and will complete the stamp mill of which the foundations were put in last Fall as soon as the weather permits.

Lower Neepawa.—This property has been purchased by New York parties, who will develop the property at once.

The Reliance Mining Company, which last year took over the Independence Mine from the Manitou Lake Co., will erect the ten stamp mill which is already on the ground as soon as navigation opens.

Those interested in the success of the mining industry in general are looking forward hopefully to the opening of navigation, when it is believed there will be a considerable revival of mining work, both in the Lake of the Woods, and in the Wabigoon and Manitou regions.

It is reported that a good body of quartz,—panning freely,—has been struck in the south crosscut of the *Homestake Mine.*

After the *Stella* shaft had been sunk 25 feet further work was abandoned by the Americans who had the option and the same happened at the *Mammoth*, north of Black Sturgeon Lake, only that 55 feet had been sunk on it. These operations have been very disappointing.

The steady shipments made from the Sakoose mine since the Ottawa Gold Milling and Mining Co, took the property over from Messrs Watson and Munro, have entitled this mine to be ranked among the regular bullion producers of the district, and it is the one property in this vicinity which has been worked continuously ever since the first shaft was commenced.

Sinking in No. 1 shaft is being continued down to the third level, drifts having been commenced on the second.

The usual quota of cars of ore leave the Sakoose for Keewatin weekly.

Mr. Paul Gasse who is manager at the Sairey Gamp mine on the Manitous was in town this week and in a report of an interview *The Rat Portage Miner* says the shaft at the *Saivey Gamp* is now getting down to the second level, and that the cross-cut has exposed a large body of quartz.

The *Gold Standard*, has now a shaft down 80 feet in quartz with a good foot wall. The vein is a wide one.

Canadian vs. United States Steel Manufacturers.

Mr. A. J. Moxham, general manager of the Dominion Iron and Steel Company, is evidently not at all discouraged by the movements of the great steel combine in the United States; on the contrary, he believes that Canada will manage to oust the American steel makers from their present leading position. He claims that in competition in the world's markets, the new works at Sydney, Nova Scotia, have an advantage of fully 25s. per ton over Pittsburg. The ore used at these works comes from Belle Isle, Newfoundland, and has to be shipped a distance of 402 miles, the cost of transport to the ore piles at Sydney being 1s. 8d. per ton. This ore contains 52 per cent. of iron. Extremely pure lime for flux is delivered at Sydney at a cost of 7½d. per ton for freight, whilst the coal is obtainable on the spot. Hence the cost of assembling the materials necessary for producing one ton of pig iron is said to be 3s. 3¾d., whilst the corresponding figure for Pittsburg, in spite of the enormous sums expended in facilitating transportation, is said to be not less than 1cs. 2¾d. Sydney, being on the seaboard, has much greater facilities than Pittsburg for shipment of its products to all over-sea points.

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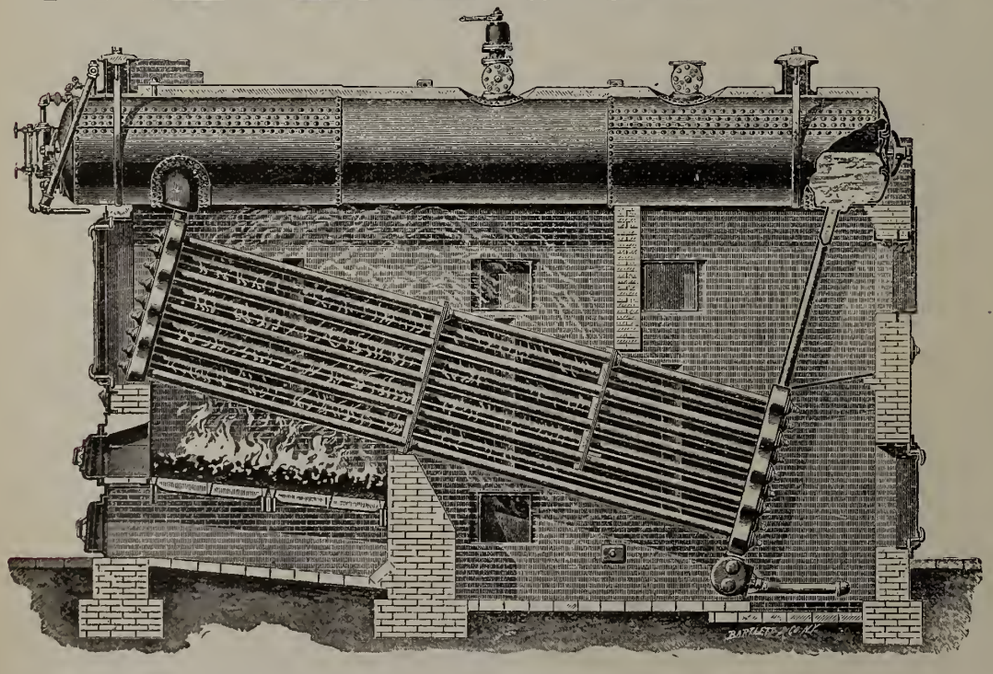

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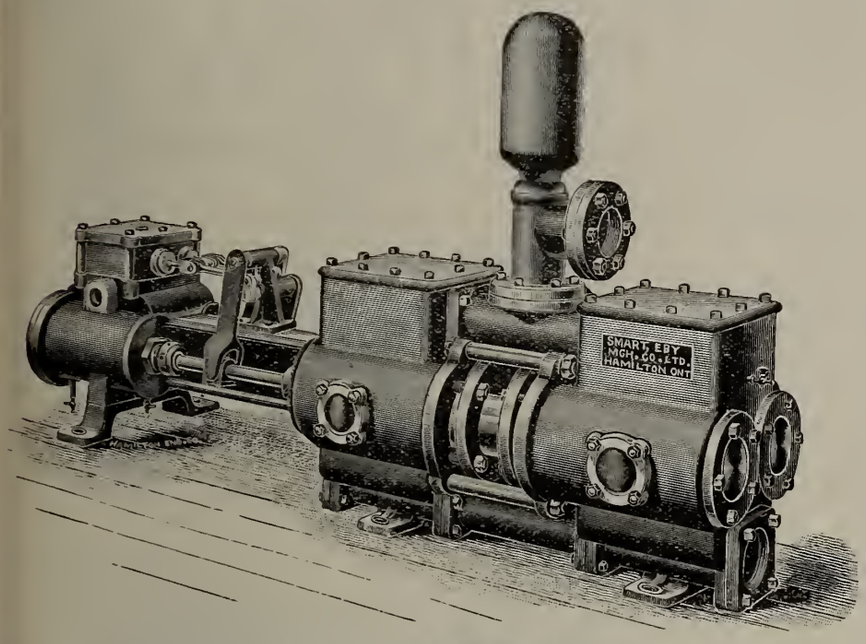
BOUNDARY'S BIG TONNAGE.—A local paper figures the Boundary ore tonnage for the first three months of the year as 75 910 tons. Of this amount 68,058 was treated by Boundary smelters. The balance, from the B.C. mine, in Summit camp, was sent to Trail. The total shipments for last year amounted to about 100,000 tons, and for 1901 it is anticipated it will run up to fully 300,000 tons.

ROPES.—The importance in mining of the work performed through the application of ropes, demands that the material of which they are made shall be such as to enable them to bear successfully, and for a satisfactory time, the varied and constant strains to which they are daily subject, and in order to fill these requirements, steel—such as Bessemer Steel, Langs Patent Steel, and Plough Steel—is now commonly employed for their manufacture. Mining ropes are always thicker for winding than for haulage purposes, and in order that all ropes shall be sufficiently strong for the work they have to perform, it is common to employ a factor of safety, or safe working load sufficiently below the breaking strain of the rope, and such factor of safety may be defined as the ratio that the breaking strain bears to the safe working load. The factor of safety varies according to the work the ropes have to perform, and it is common to employ factors of safety for winding ropes varying from ⅛ to ⅛ of the breaking load, and for haulage ropes it is common to employ as a factor of safety ⅙ of the breaking load.

Coal consumption in blast furnaces varies with the amount of moisture in the air. In a discussion before the Pittsburg Foundrymen's Association it was stated that under normal conditions—with the temperature at 70 Fahr. —1,000 cubic feet of air, equal to 75 pounds, contain one pound of moisture, and that each pound of moisture requires one additional pound of coke. Tests have proved that when the air is charged with moisture, from 200 pounds to 300 pounds more coke are required for producing a ton of iron than when the air is dry and comparatively little moisture is blown into the furnace. Heating the air does not eliminate the moisture.



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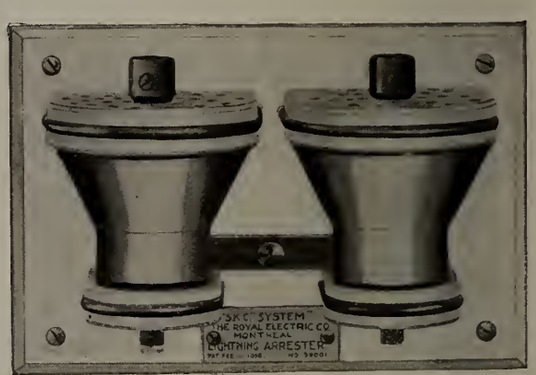

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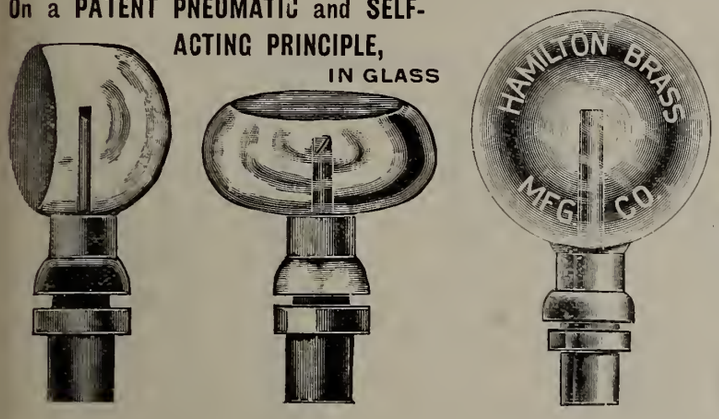

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Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite: copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

HONORABLE E. J. DAVIS,
Commissioner of Crown Lands,

or

THOS. W. GIBSON,
Director Bureau of Mines,
Toronto, Ontario.

PROVINCE of QUEBEC

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The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
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GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Proviuce extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,
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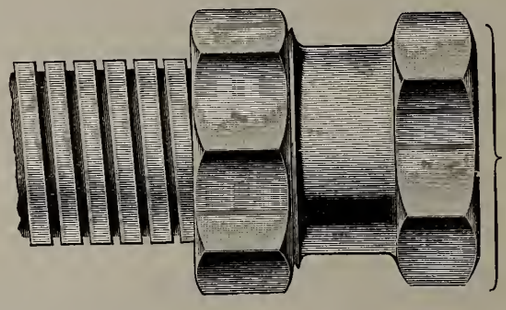

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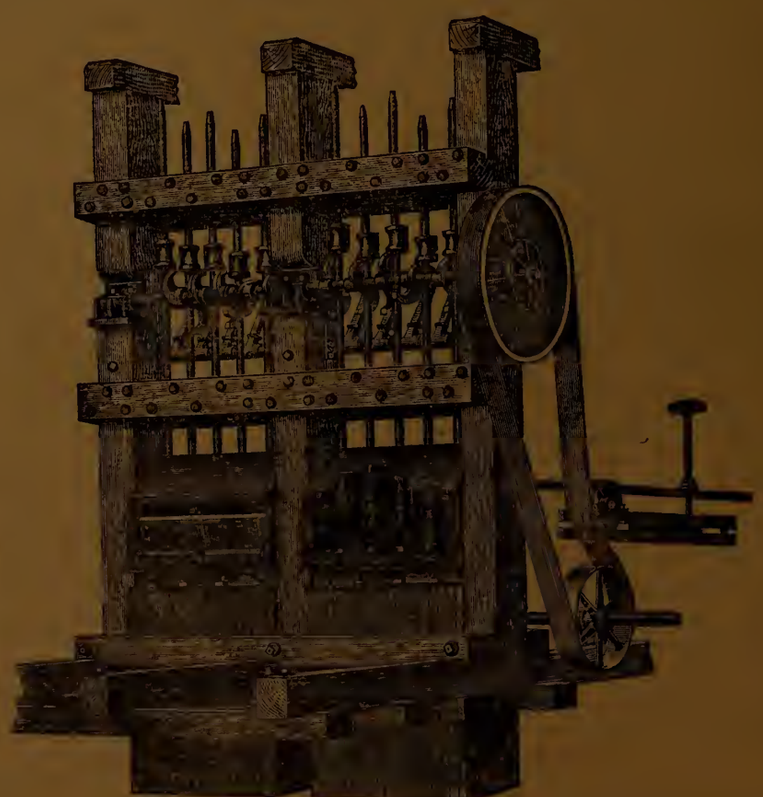

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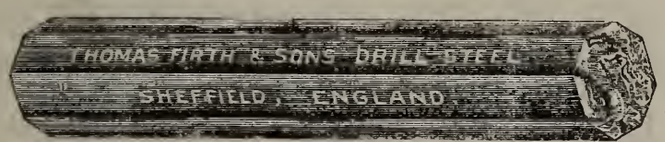

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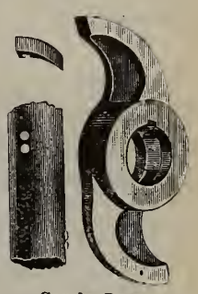

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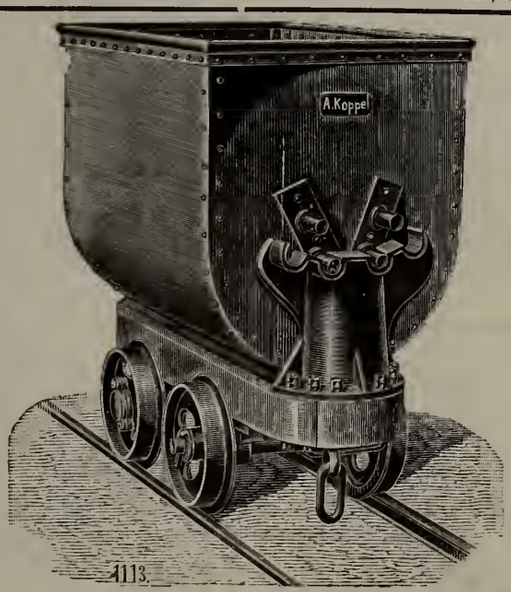

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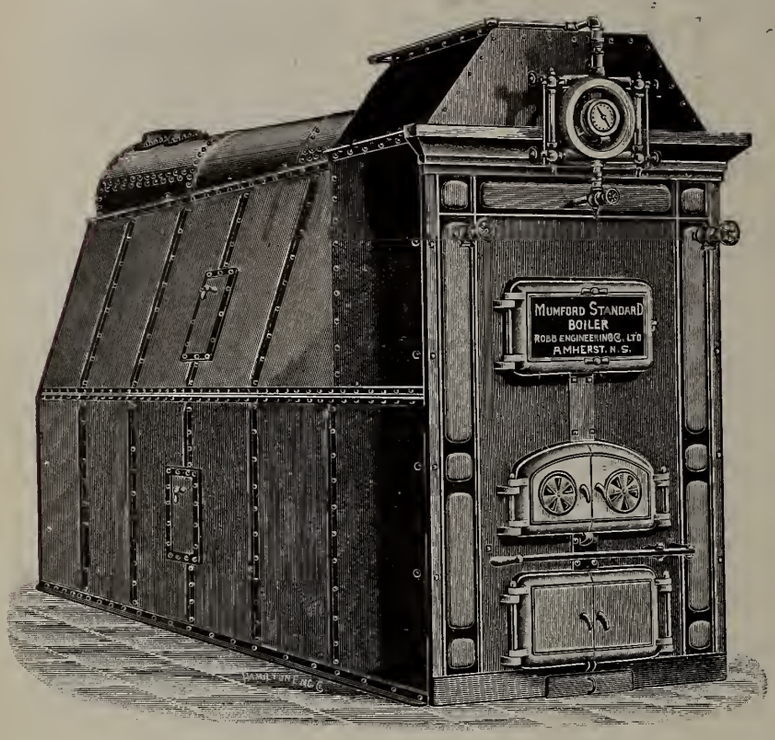

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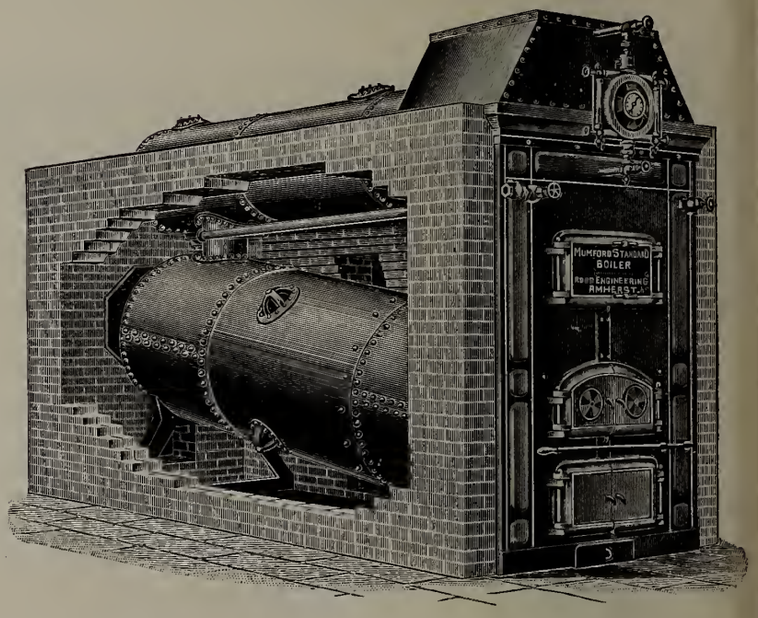

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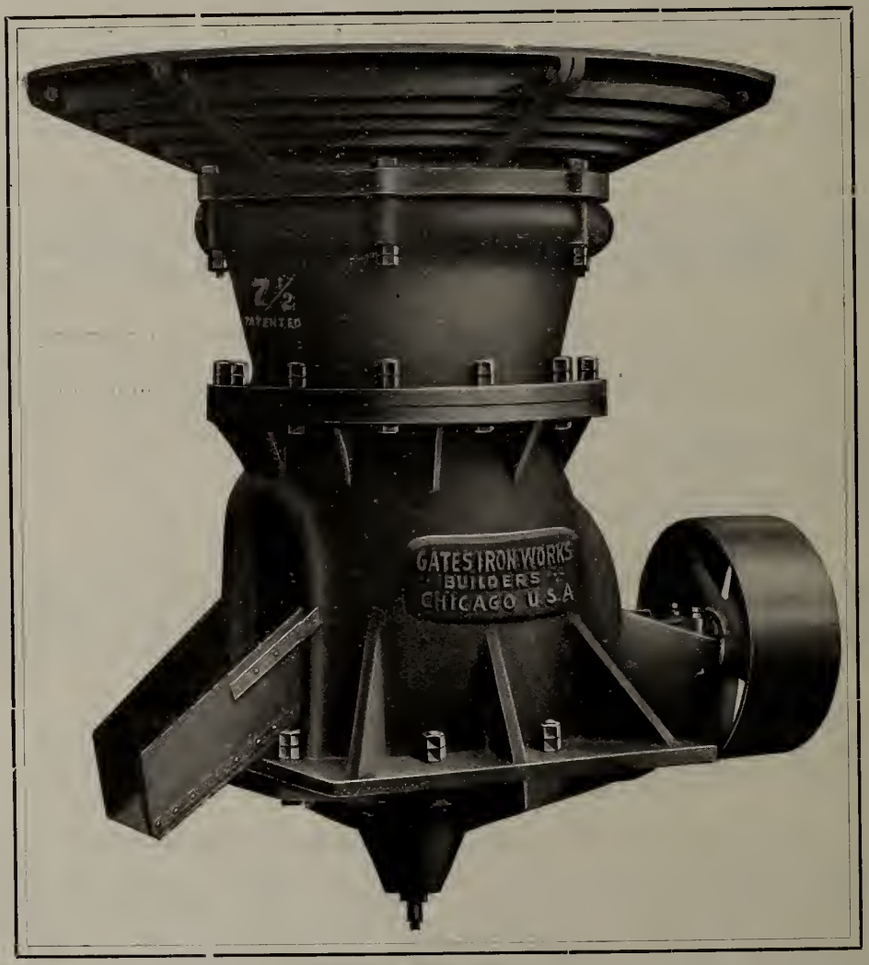

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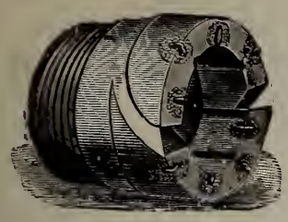

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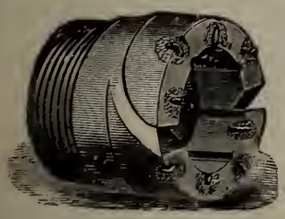

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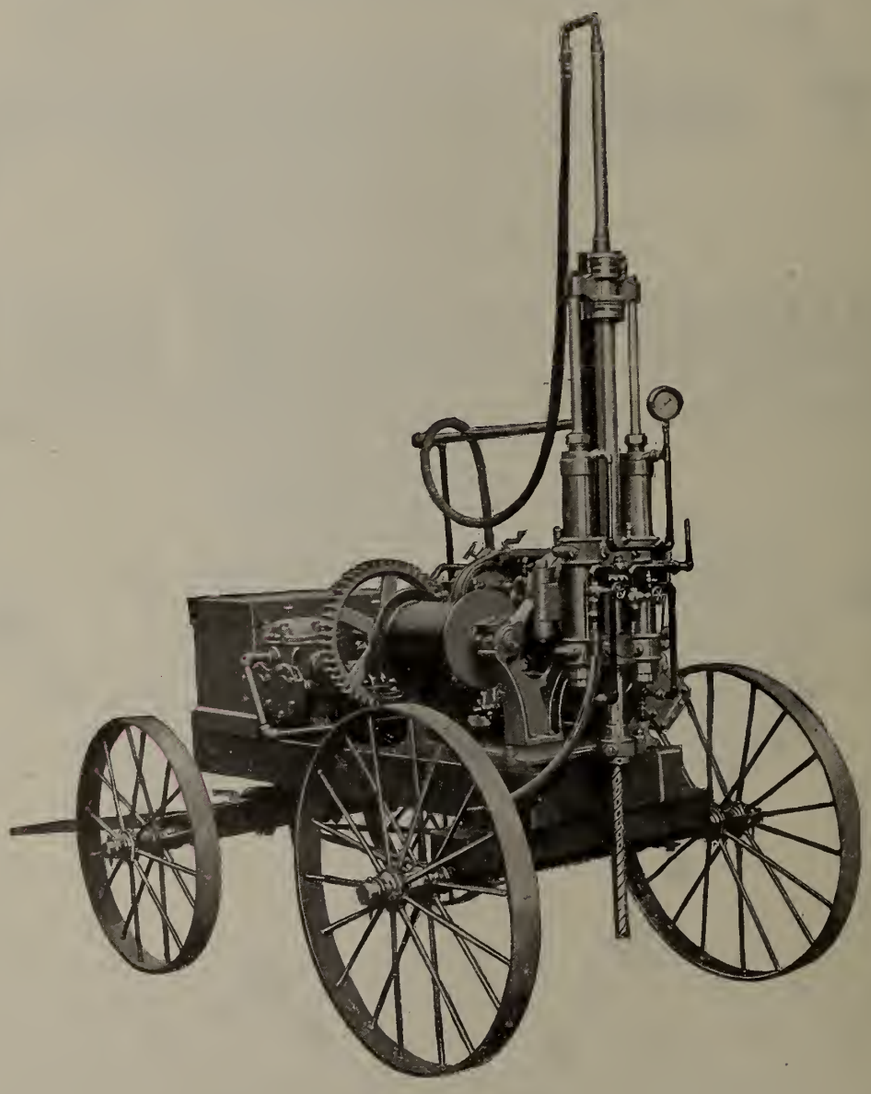

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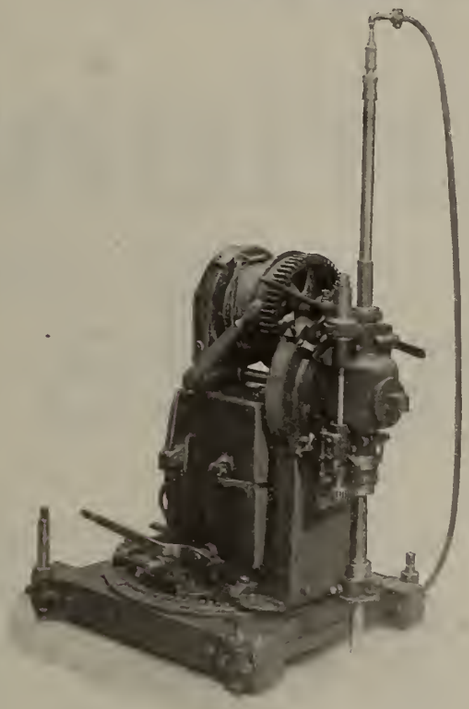

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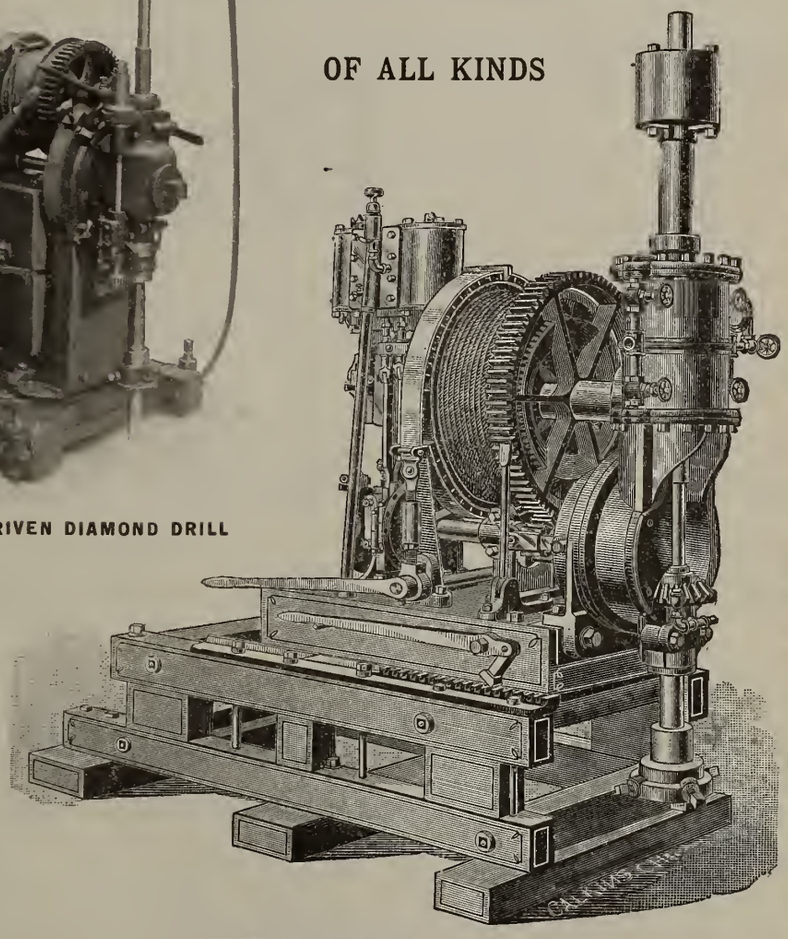

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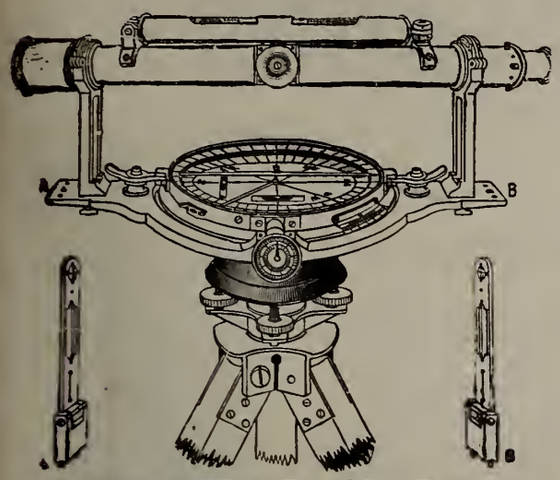

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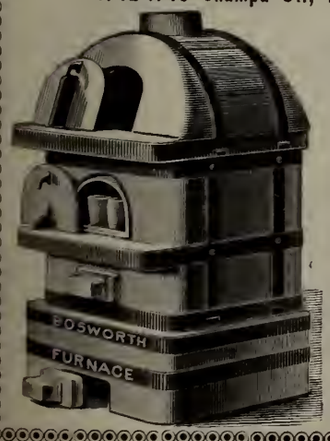

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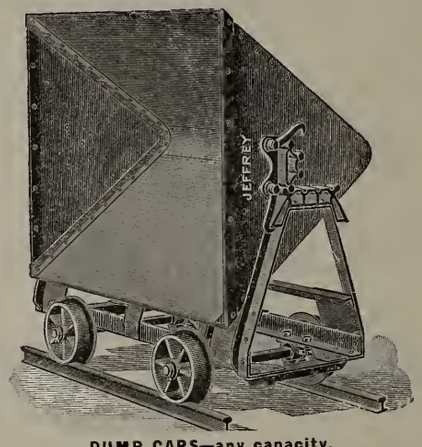

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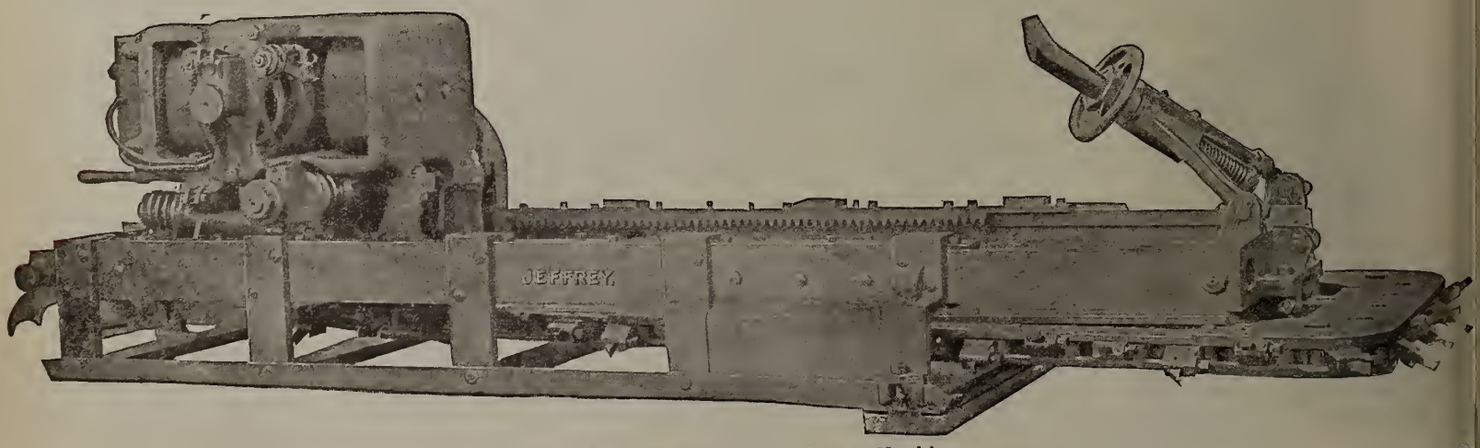

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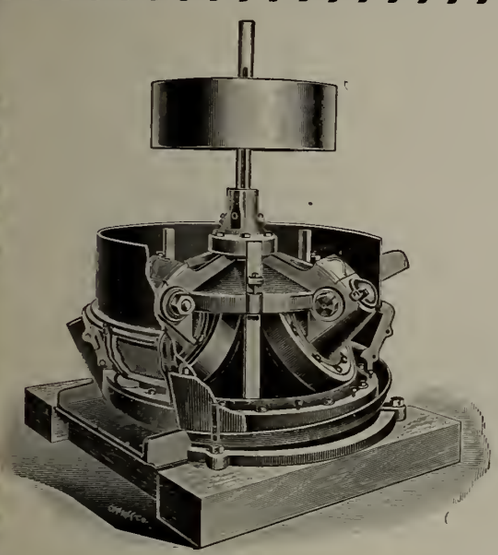

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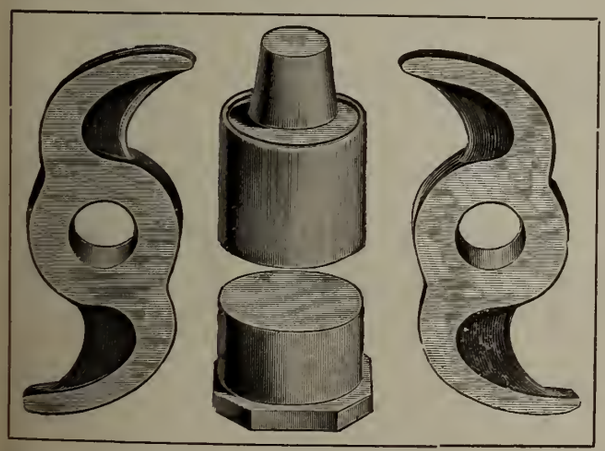

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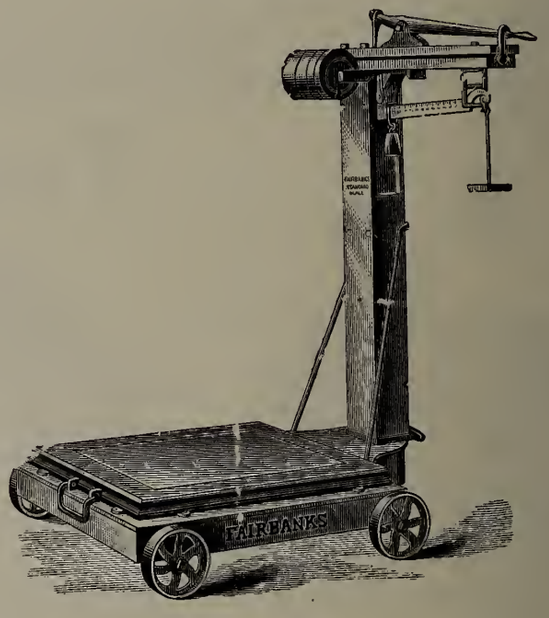

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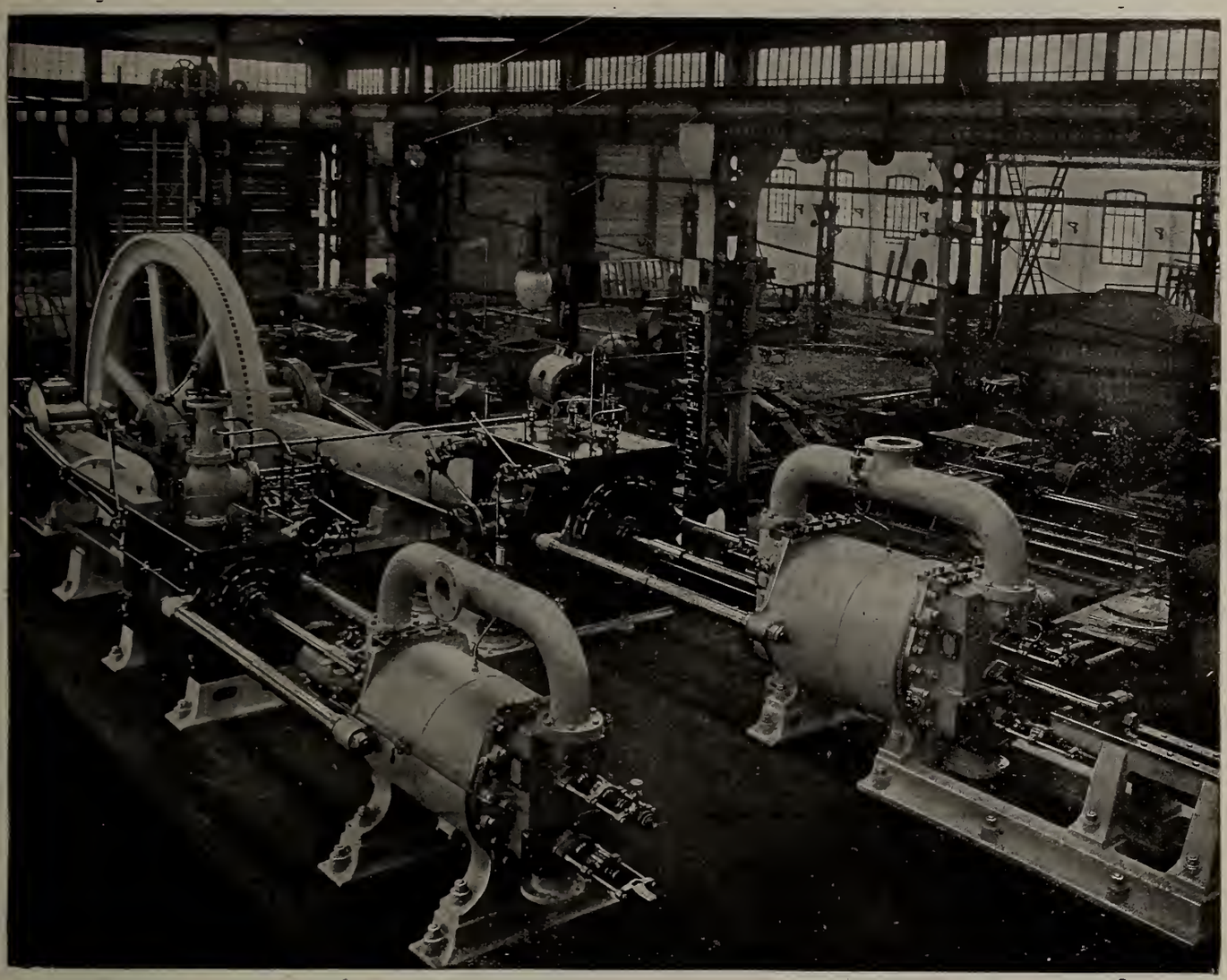

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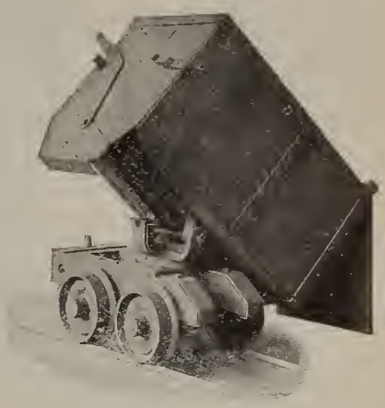

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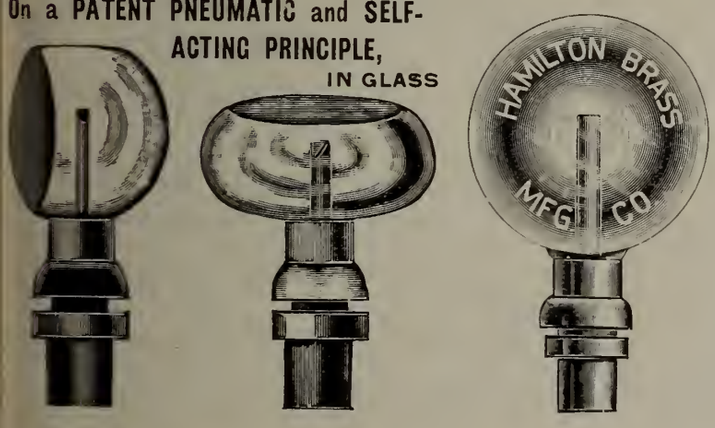

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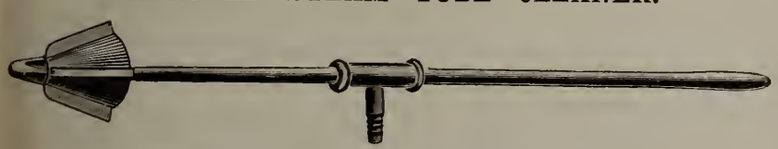

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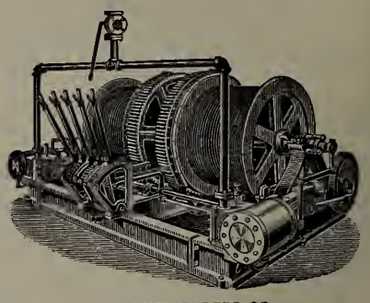

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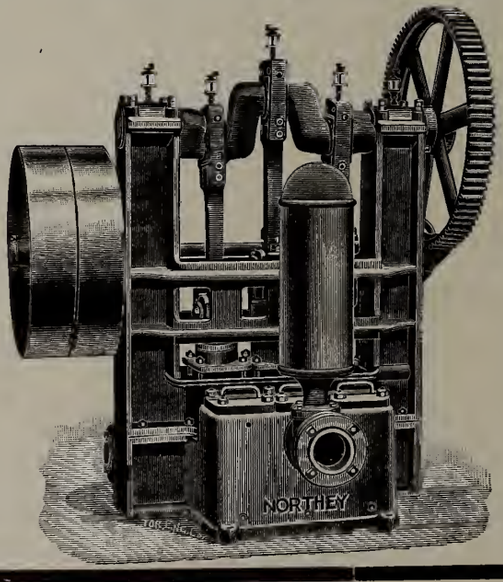


We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

THE NORTHEY CO., Limited, Toronto, Ont.

19th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 5. MAY, 1901. VOL. XX., No. 5.

Stock Gambling vs. Mining as an Industry.

For the benefit of those who are suffering from the serious decline in mining shares on the Canadian market we wish to state that, taking the whole of North America, including Mexico, the value of the raw mineral output is second in importance only to that of the agricultural produce. No other single industry can compare in magnitude with either of these two. We believe the political economists are with us in affirming that the only two possible sources of wealth are the farm and the mine, taking these terms in their most broadly inclusive senses. These then are the bases upon which human industry depends.

It need hardly be said that the minerals of North America are not produced at a loss. On the contrary the mineral industry constitutes the legitimate source of revenue for a large proportion of the people of the western hemisphere. These people have cast their fortunes with the industry; they know that by following it they can do what men in other walks of life accomplish, viz., feed and clothe themselves and their families, and, if prudent and able, lay up a snug sum, or even grow rich. These men men belong neither to the ranks of the gamblers nor the well-meaning adventurers. They are concerned as other men are in the simple business of gaining a sure reward for industry.

Now what about those who are so loudly denouncing mining as a gamble? How is it that so many shrewd business men, merchants, lawyers, doctors and others, smile a knowing but sickly smile when you question them on mining investments? The fact is they have not been in mining at all. They have been gambling, and furthermore they know they have been gambling. The good deacon dare not play poker, but he can buy mining shares. We presume the original sin must have its safety valve. The savage loves to gamble, and civilization has not rooted out all our primitive traits. But the savage playing at "moccasin" or the gambler staking his pile in a "freeze out" does not imagine that he is engaged in business. There is a difference, and a big one. We should know what we are about, and be careful not to call things by the wrong names.

There are men who gamble in mines without speculating in stocks. They buy large, often controlling, interests in so-called mines. They know nothing about mines or minerals. They are easily fooled by promoters and by men who profess to know how to manage mines. They hope for large profits on relatively small investments. They expect by burnishing an old rusty Aladdin's lamp to see the genii come with unearned riches. It is contrary to nature's law to gain without giving a fair equivalent. It matters little whether this equivalent be hard earned money or harder earned experience. Of the two it is the latter which counts most, which reaps the larger reward. The fortunes of the great men in the mining world were not accidents, but came because they had learned to know a good mine when they saw it, and how to make it pay when they acquired it. This is not gambling; it is not luck.

We wish to insist that gambling in mines is not mining, and that men who lose money in such speculation are not deserving of any sympathy. A mine conducted in a proper manner is very rarely capable of forming a basis for stock gambling. Such a mine will have a large amount of money annually expended in development work, blocking out ore reserves far in advance of the production, so that the prospects for some years ahead can be accurately estimated, not guessed at. There is no more certain indication that a mine is unsafe as a business proposition than the announcement of rich "strikes" heralded by the press and circulated on the stock exchanges, for the purpose of influencing the price of shares. A rich "strike" is of no value whatsoever until the new find has been thoroughly prospected, and it takes many weeks to block out any respectable body of ore large enough to warrant a change in current values of the stock. If the anticipation of possible large blocks of richer ore from the finding of good values at the end of a 5 ft. x 7 ft. drift, by a sudden elevation of the quotations on stock, is not gambling, pray, what is it?

Speculation of this sort is particularly harmful to the mining industry because the public confuses trading in shares with actual mining investment. The result is that conservative men gain the impression that mining is essentially risky, and in consequence will not even investigate the merits of sound enterprises which need capital to put them on a producing basis.

What we wish to insist upon is that the public shall, in the first place, discriminate sharply between mining and gambling, and in the second place realize that they can guard themselves against unprofitable investments by obtaining reports by mining engineers of experience and reputation. The peculiar character of the mining world, with its admixture of the good and the bogus, has resulted in the development of two classes of men assuming to report upon mines, corresponding in their characters to the phases of the industry to which they respectively devote themselves. But the prudent investor can easily investigate his engineer, if he chooses so to do. Any reputable engineer is sure to be a member of one or more of the great institutes of mining engineers of the world, and the secretaries of these institutes can always give information concerning their members, and refer inquiries to well known capitalists who may be able to vouch for a man in good standing.

There would seem to be no reason why a capitalist should not know the character of the man on whose judgment he risks his money

in mining as he would do if he were going to invest in a manufacturing enterprise. In this way lies safety, but if he rushes blindly into a field concerning which he knows nothing, and where he provides no safeguards, he need only expect the reward of folly. But then let him at least be honest enough to upbraid himself instead of the whole mining world.

Just now this question of mining investment in Canada is a serious one. The country has suffered from a *boom*. A boom inevitably means business conducted under the influence of temporary insanity, stimulated by more or less knavery. The harvest is according to the seed sown. In this particular case the losses have been estimated to amount to something more than $30,000,000. This figure has been arrived at by a recent writer in the Montreal *Star* by taking the difference between the highest prices and the recent low prices of stock. The tables which he has prepared are of such interest that we reproduce them below :—

PRICES OF MINING SHARES.

	Highest.	Lowest.
War Eagle	$3.88	.14
Centre Star	1.70	.30
North Star	1.00	.60
Republic	1.40	.15
Virtue	1.20	.10
Payne	1.68	.25
Mont.-London	.96	.02½
Big Three	.38	.01½
Brandon & G. Crown	.30	.05
California	.14	.04
Fern	.75	.02
Gold Hills Dev	.08	.01
Iron Colt	.18	.01
Iron Mask	.85	.35
Knob Hill	.95	.50
Monte Christo	.30	.01
Montreal Gold Fields	.30	.01
Noble Five	.35	.07
Old Ironsides	1.15	.80
Virginia	1.10	.01
Rambler-Cariboo	.35	.20
Slocan Sovereign	.38	.03
Golden Star	.70	.02

LOSSES FROM INFLATION AND DECLINE OF VALUES OF SHARES.

Name of Mine.	Capitalization.	Inflated Value.	Deflated Value.	Difference.
War Eagle	$1,750,000	$6,790,000	$245,000	$6,545,000
Centre Star	3,500,000	5,950,000	875,000	5,075,000
North Star	1,300,000	1,300,000	780,000	520,000
Republic	3,500,000	4,900,000	525,000	4,375,000
Virtue	2,000,000	2,400,000	200,000	2,200,000
Payne	2,500,000	4,200,000	625,000	3,575,000
Mont.-London	432,000	414,000	15,120	399,600
Big Three	3,500,000	1,330,000	52,500	1,277,500
Brandon and Golden Crown	1,500,000	450,000	75,000	375,000
California	2,500,000	310,000	60,000	250,000
Fern	250,000	187,500	5,000	182,500
Gold Hills Dev	2,500,000	200,000	25,000	175,000
Iron Colt	1,000,000	180,000	10,000	170,000
Iron Mask	500,000	425,000	175,000	250,000
Knob Hill	1,500,000	1,425,000	750,000	675,000
Monte Christo	2,500,000	750,000	25,000	725 000
Montreal Gold Fields	800,000	240,000	8,000	232,000
Noble Five	1,200,000	420,000	84,000	336,000
Old Ironsides	1,000,000	1,150,000	800,000	350,000
Virginia	500,000	550,000	5,000	545,000
Rambler-Cariboo	1,000,000	350,000	200,000	150,000
Slocan Sovereign	1,500,000	570,000	45,000	525,000
Golden Star	1,000,000	700,000	20,000	680,000
	$38,232,000	$35,190,220	$5,804,620	$30,197,600

A bad feature of all this is that the excitement in mining stock speculation has been assiduously fomented by the newspapers, and it is a misfortune of a very considerable portion of the public to credit as truth every news item because it is printed in a newspaper. We are willing to believe that the average respectable newspaper would exclude any items its editor knew to be untruthful, and in some cases an effort to ascertain the truth is made. But we doubt whether any editor ever investigated the truth of a boom item on mining, and in consequence the most that he prints is false. We are not referring to the local press of the mining regions. These papers of course would not offend local patriotism by any adverse criticism on mines in the district. Sometimes they make unsavory remarks upon rival camps that are worthy of more or less attention. But the leading journals of the country should consider that they exercise an influence for good or ill upon the investing public, and they should be held responsible for news items that affect the stock market or, what is better still, they should suppress all mining news as being foreign to their field, and print only the quotations in their share list.

We quite believe that this has worked detrimentally to Canadian interests, as stated by Mr. J. H. Curle, E.M., in his recent volume, "The Gold Mines of the World": "*Day by day an astonishing mass of crude, irresponsible gossip, and a great quantity of lies, appear under the guise of accurate mining intelligence. Anybody with a special purpose to serve can in the shape of an interview, have his views on any given mine printed by the column, while an honest critic venturing an unfavorable opinion, is fiercely denounced both by the press and the public.*"

A Far Cry for Money.

Will not some generous soul in Rossland please pass the hat, take up a subscription, in the name of charity, and turn the proceeds over to The Big Four Consolidated Gold Mining Company, Limited! You will find the company sitting desolate on the side of Red Mountain, for it has no fixed abode, pays no office rent, pays no salaries, but needs money for dynamite and bacon and boom literature. It has just made a pathetic appeal to its 100 stockholders to do something, to put the shoulder to the wheel, and by a valiant effort sell 500 shares at 6 cents a share! "This will enable us to complete and pay for 200 feet of tunnel work now under way, which work is absolutely necessary to place this splendid property on the London market without delay"—so reads a special printed bulletin of the company. Not long ago it cried out for $1,500, which it affirmed would put the property on a self-supporting basis.

Now, we have infinite sympathy with struggling humanity, and would not injure any man's chances of success. This may be a most deserving enterprise, but its promoters are not men of good judgment, to say the least. A company that only needs $1,500 as a maximum for putting a mine on a self-supporting basis has misused what funds it did possess, when, as witness its own confession in a circular dated January 1, 1901, it has done the following: "We have advertised in *fifty* newspapers, large and small, from the Atlantic to the Pacific, likewise sent out over 5,000 circulars, letter-heads, prospectures, etc., and we venture to say have *done more work with less money* than any company in British Columbia."

We might point out absurdities and conflicting statements in its voluminous "literature," and even show that it practically needs no money at all, since "the Great Northern Railway runs three times through the ground.....and we are now ready to start shipping ore," but we have already given the company enough free advertising. For the sake of the good name of Rossland and British Columbia let some of the kindly-disposed Rosslanders give these poor people a few cents with which to start shipping ore, and put an end to the circulation of this printed nonsense that can only become a reproach to the district.

Amendments to the British Columbia Placer Mining Law.

A very commendable effort is being made, largely under the leadership of Mr. John B. Hobson, Manager of the Consolidated Cariboo Hydraulic Mining Company, to secure an amendment to the Placer Mining Act of 1899, in the interest of the poor prospector primarily, and incidentally in the interest of the development of the hydraulic mining industry of the province. Under existing regulations the holder of an 80 acre leasehold on deep placer mining ground must pay an annual rental of $50, a fee of $5 for the issuing of papers, and in addition must do development work of the value of $1,000 a year. Manifestly this law was not framed for the encouragement of prospectors, upon whom alone every mining region depends for its reconnaissance and initial development Only large syndicates or corporations could perform development work under the onerous conditions imposed by this Act. The proposed remedy is to practically copy the law which went into force in California in 1872, which permits any person to locate 160 acres of land on the payment of a small fee and to hold the same by performing work thereon of a value of $100 annually.

As pointed out by Mr. Hobson, the result of that law was to bring into California $100,000,000 which in ten years was paying a profit of about $15,000,000 per annum. As opposed to this in British Columbia only about $6,500,000 has been invested in deep placer mining, although the district of the deep placer grounds is believed to exceed in importance that of central California.

Much fear is expressed in certain quarters that a liberal law in British Columbia would result in the acquisition of extensive mining territory by powerful corporations, which would hold it idle for a long period. Perhaps this might be the case if title were easy to acquire, and taxation light. The remedy for this, suggested by Mr Carter-Cotton, is not to grant titles at all, but to lease the properties under satisfactory safeguards to ensure continuous development work. Even this has its disadvantages, especially for a company doing bona fide work on a large scale, unless the expenditure at the point of actual operation were to be considered as applying to the entire tract constituting the reserves of the corporation.

It is folly to take a petty view of deep placer mining conditions. Their successful operation demands costly preliminary works in the form of flumes, sluices, etc., an installation which necessitates a large area of gravel which can only be worked as a rule at one point, but which will progressively be washed until the deposit is exhausted. We cannot see any cause for alarm if a company should consolidate a large number of separate claims, nor any reason why it should be required to waste money in useless expenditures upon each and every 80 acre lot in the piece, since for practical mining purposes it must be viewed *en bloc* as constituting a single property of large enough dimensions to warrant the provision of suitable facilities of economic exploitation.

Certainly the law of 1899 was prohibitive of new enterprises. It operated against both prospector and mining company. In an excess of zeal to prevent monopoly it stifled enterprise. Monopoly it is well enough to avoid, but this can be prevented without denying to the public opportunity to profitably employ time and money in unfolding the resources of the country. This condition seems to be fairly met in the draft of the proposed amendment which limits a claim to 80 acres, requires the payment of an annual rental of $25, work to the amount of $100 per year, and the privilege of obtaining a concession until worked out on the payment of $500 cash, and subsequently of $25 a year rental.

The Egerton Syndicate, a Glasgow corporation, has acquired, and is now working, the well-known gold properties at 15 Mile Stream, N.S., formerly successfully worked for many years by the New Egerton Gold Mining Co.

Mining Progress in Ontario.

The output of the metalliferous mines and works of Ontario for the three months ending 31st March, 1901, as returned to the Bureau of Mines, was as follows :—

	Quantity.	Value.
Iron Ore ..... tons.	36,503	$ 44,106
Pig Iron ..... "	28,694	438,659
Nickel ..... lbs.	1,805,691	190,858
Copper ..... "	1,680,391	75,625
Arsenic ..... "	236,054	12,046
Gold ..... ounces.	3,150	54,520
Silver ..... "	20,077	12,046
Total		$827,860

The total value of the above products for 1900 was $2,541,131, consequently the output for the first three months of the present year shows a proportional increase of about 30 per cent. The largest increases are in iron ore and pig iron; nickel and copper remain at about the same level of production; arsenic shows a decided increase, while gold and silver have fallen off.

The quantity of iron ore smelted into pig iron at the three furnaces of Ontario, all of which are in steady operation, was 48,663 tons, of which 21,083 tons were from Ontario mines and 27,580 were imported ore. The proportion of native ore smelted during the quarter rose to 43 per cent. of the whole, as against 23 per cent. in 1900. In addition to the ore 3,486 tons of scale and mill cinder were smelted.

The total quantity of nickel and copper ore mined during the period was 72,036 tons, being a proportional increase as compared with the whole of 1900 of 31 per cent. The new nickel-copper and copper mining companies are beginning to raise considerable quantities of ore, but not much of it has yet been smelted.

The quantity of gold ore crushed was 10,174 tons.

On the whole the outlook is for a decided increase during the present year in the quantity and value of the product of Ontario's metalliferous mines and furnaces.

Mining Progress in Quebec.

The annual report of Mr. Obalski, Inspector of Mines, covering the year's mining operations in the Province of Quebec, has just been issued and contains, as usual, a large amount of serviceable information concerning the iron, asbestos, mica, chromite, pyrites, graphite and other important mining industries in the Province. Mr. Obalski reports an increase in the value of the total production over the previous year, estimating the value of all products produced in 1900 at $2,546,000, but, at the same time, he is careful to point out that these figures would be much increased if the value of the manufactured products were given.

The industry employed 5,400 persons, the wage earnings for ten months being estimated at $1,300,000. The following amendments to the Mining Act were passed at the last session of the Quebec Legislature :—

1. The Crown abandons its rights to mines, except as regards gold and silver, on lands patented previous to 24th July, 1880, but only in the townshipts and on those in connection with which all the conditions for obtaining letters patent had been fulfilled prior to that date.

2. The right of pre-emption granted to surface-owners is abolished for all mines belonging to the Crown in townships as well as in seigniories.

3. In the case of private lands, whether the mines belong to the Crown or to any person other than the surface-owner, expropriation is effected in the manner set forth in the Mining Act.

4. The provisions of the Act of 1892 remain the same with regard to the price of mining lots, licenses, etc.

Lead Bounty.

Als a result of the interview of the Kootenay delegation, reported in these columns last month, the Dominion Government has granted a bounty on lead to be refined in Canada.

The resolution brought down by the Hon. the Minister of Finance reads:

Resolved, that it is expedient to provide as follows in order to encourage the refining of lead in Canada:—

1. That the Governor-in-Council may authorize the payment of the undermentioned bounties on lead refined in Canada from materials produced in Canadian smelters from Canadian lead ore; (a) on every ton of lead so refined during the calendar year 1902, $5; (b) on every ton of lead so refined during 1903, $4; (c) on every ton of lead so refined during 1904, $3; (d) on every ton of lead so refined during 1905, $2; (e) on eveey ton of lead so refined during 1906, $1.

2. The said bounties shall be payable half-yearly on the first days of July and January in each year.

3. The total sum payable for such bounties shall not exceed $100,000 in any year. If the sum payable at the rate per ton mentioned in resolution (1) on lead refined during the half of any calendar year shall exceed $50,000, then and in such cases the bounty payable per ton shall be reduced as regards that half-year to such rate per ton as shall make the amount of bounties payable in respect of such half-year not more than $50,000.

4. If the sum paid for such bounties in any half-year shall be less than $50,000, the unpaid balance (being the difference between the sum so paid and $50,000) shall be carried to the credit of the bounty fund for the next succeeding half-year, and may be paid out in such succeeding half-year, in addition to the $50,000 herein before provided.

5. The Governor-in-Council may make such rules and regulations (including regulations as to rates and charges for refining) as may be deemed expedient in the public interest, for the carrying out of the purposes of this Act, and all payments of bounty shall be subject to the due observance of such rules and regulations.

6. All bounties payable under these resolutions shall cease and determine on the thirty-first day of December, 1906.

Dawson & Selwyn Memorial Portraits.

In recognition of the invaluable services rendered towards the development of the mineral wealth of Canada by the late Dr. George M. Dawson and his predecessor, Dr. A. R. C. Selwyn, late Directors of the Geological and Natural History Survey of Canada, the Canadian Mining Institute invites subscriptions from the Canadian mining public towards its fund for the purpose of presenting suitable portrait paintings of the late Directors to the Museum of the Survey with which their life work has been so prominently identified. Remittances marked "Dawson and Selwyn Memorial Portraits" should be sent to the Treasurer of the Canadian Mining Institute, Mr. J. Stevenson Brown, Temple Building, Montreal, or to the undersigned. All subscriptions will be acknowledged in these columns. The following amounts have been subscribed to date:—

B. T. A. BELL,
Secretary.

Canadian Mining Institute	$100.00
Officers of the Geological Survey	54.00
Hon. Sydney Fisher, M.P., Ottawa	25.00
London & B. C. Gold Fields, Ltd, Nelson, B.C.	25 00
Canadian Mining Review, Ottawa	25.00
MacKenzie & Mann (per D. D. Mann), Toronto	25.00
H. C. Hammond, Toronto	20.00
John B. Hobson, Bullion, B.C.	20.00
J. Roderick Robertson, Nelson, B.C.	10.00
Dr. James Douglas, New York	10.00
W. P. Jennings, C.E., Toronto	10.00
W. H. Aldridge, Trail, B.C.	10.00
Wallingford Bros., Perkins Mills, Que.	10.00
George E. Drummond, Montreal	5.00
John J. Drummond, Midland	5.00
J. W. Evans, C.E., Deseronto	5.00
Dr. Henry M. Ami, Ottawa	5.00
S. S. Fowler, Nelson	5.00
Rinaldo McConnell, Ottawa	5.00
Dr. F. D. Adams, Montreal	5.00
W. F. Little, Anthracite	5.00
O. E. S. Whiteside, Anthracite	5.00
Eugene Coste, Buffalo, N.Y.	5.00
R. D. Featherstonehaugh, Atlin, B.C.	5.00
G. J. Ross, Nelson	3.00

NICKEL LEGISLATION.

A Review of the Grounds upon which the Dominion Government was asked to Disallow the Ontario Mines Act.

[In consequence of the urgent and emphatic representations of the mining men of Ontario for the disallowance of the "Act to amend the Mines Act," passed by the Ontario Legislature a year ago, the Dominion and Ontario Governments have conjointly agreed to submit the constitutionality of the Act to the Supreme Court of Canada.]

To show that the imposition of the license fees authorized by the said Act would be a breach of faith towards all those who have acquired mining lands in the Province of Ontario under Letters Patent issued prior to the 4th day of May, 1891, all that is necessary is to quote the declarations of the Province made by Her late Majesty, by and with the advice and consent of the Provincial Legislature.

By the Mines Act of 1892, 55 Vic., chap. 9, it was declared that:

> "All royalties, taxes or duties, which by any patent or "patents issued prior to the 4th day of May, 1891, have been "reserved, imposed or made payable upon or in respect of any "ores or minerals extracted from the lands granted by such "patents, and lying within this Province, are hereby repealed "and abandoned, and such lands, ores and minerals shall "henceforth be free and exempt from every such royalty, tax or "duty."

The said declaration was embodied in the Revised Statutes of Ontario, 1898, chap. 36, in the following words, referring to all lands granted by patents issued prior to the 4th day of May, 1891, that "such lands, ores and minerals shall be free and exempt from every such royalty, tax or duty." Similar declarations have, since Confederation, been repeatedly made. See, for instance, 32 Vic., chap. 34, sec. 3.

In the first reading of the present Act, the word "tax" was used, but, subsequently, the phrase "license fee" was substituted. But inasmuch as a license fee is a tax, and moreover just such a royalty tax or duty as was covered by the legislative declaration, that such lands, ores and minerals "shall be free and exempt from every such royalty, tax or duty," such a transparent disguise does not alter the fact that the Act now complained of is a gross breach of faith to all who hold lands affected patented prior to 4th May, 1891.

This was made the ground for the disallowance of the Act of British Columbia, 37 Vic., No. 1 (See Dominion and Provincial Legislation, 1867 to 1895, at pp. 1024 to 1028.) At page 1028 the ground for the disallowance is shown to be the honor and good faith of the Crown. The precedent so established should, it is respectfully submitted, be followed in the present case.

ACT IS CONFISCATION.

The license fees authorized to be imposed by the said Act complained of are as follows:

"(*a*) For ores of nickel, $10 per ton, or $60 per ton if "partly treated or reduced;

"(*b*) For ores of copper and nickel combined, $7 per ton, "or $50 per ton if partly treated or reduced."

These amounts exceed the value of the ores or matte so taxed, so that what is authorized is plainly confiscation without compensation, and moreover the lands so to be confiscated were granted under the Great Seal of the Province of Ontario unconditionally in fee simple.

This follows from common knowledge of the value of such ores, but is conclusively shown by the official reports issued by the Province of Ontario. The report of the Bureau of Mines, published in 1899, for the year 1898, states that 120,924 tons of nickel and copper ore were smelted, producing 21,101 tons of matte valued at $782,300.

The above tax of 21,101 tons of matte would amount to $1,055,-050, being in excess of the total value of the product by $272,700.

Further, according to the same report, the amount paid out in wages alone was $315,501, which means that the amount of duty and wages would exceed the value of the product for that year by $488,-201.

For the year included in the report of 1900 (at page 18), it is stated that the total quantity of the ore smelted in that year was 171,230 tons, yielding 19,215 tons of matte of a total value of $702,-440. The duty on 19,215 tons of matte at $50 per ton would be $960,750, the duty thus being greater than the total value or product in that year by $258,310.

Further, the report shows that the wages paid in that year amounted to $443,879, so that the duty and wages for that year would, if the Act were enforced amount to $702,189 more than the total value of the product.

It is further to be pointed out that these licence fees are declared to be a charge upon the land, and that if same are not paid power is given to the Attorney-General of the Province to foreclose the estate and right off all persons claiming any interest in the property from which the ores to be taxed are mined or won. It is pointed out that this confiscation is not for the purpose of producing Provincial revenue or for the purpose of dealing with property and civil rights within the Province, but for the purpose of attempting to regulate trade and commerce, a matter committed to the exclusive jurisdiction of the Dominion Parliament.

The present Act is, therefore, an attempt to do indirectly what would be wholly beyond the power of the Province to do directly.

In view of the mischevious consequences which will flow from such trenching upon Federal authority, the present is pre-eminently a case in which the power of disallowance, which involves a corresponding duty, should be exercised.

To quote the language used in a report confirmed by the Governor-General-in-Council in reference to a previous unsuccessful attempt to encroach upon Federal jurisdiction, the Act now complained of is "objectionable in principle, and calculated to produce a feeling of insecurity abroad with reference to Provincial legislation."

VESTED INTERESTS THREATENED.

It follows from the above that the vested interests of all who had acquired lands patented prior to the 4th of May, 1891, are threatened by this legislation, and if the present Act is not disallowed the security of all Canadian investments under Provincial control, and particularly of all Canadian mining investments, will be sensibly diminished.

In Provincial and Dominion Legislation, 1867-1895, p. 1048, the section of the British Columbia statute there referred to is said to be objectionable "because it may be an interference with the vested rights of individuals without providing any compensation therefor."

The same view was expressed in the report of 19th of May, 1893, adopted by order in Council of 2nd June, 1893, where it is said on the assumption thus expressed, that "the case would appear to be that of of a statute which interferes with vested rights of property, and the obligation of contract without providing compensation, and would therefore, in the opinion of the undersigned, furnish sufficient reason for the exercise of the power of disallowance.

TRENCHES ON DOMINION JURISDICTION.

That the object and intention of the Act complained of is not to deal with any matter over which the Province have jurisdiction, but indirectly to attempt to regulate trade and commerce, has been clearly shown. This was the object stated in reference to the Act, both at the time of this introduction and of its being assented to, and the same conclusion results inevitably from a consideration of the circumstances under which the Act was introduced. In fact, it is obvious that under the guise of dealing with licence fees and property and civil rights, the purpose and object of the enactment is to deal with matters entrusted to the exclusive jurisdiction of the Dominion Parliament, and, as has been laid down in the Courts, however carefully such object or purpose is veiled, the foresight of those who framed our Constitution has led them to provide a remedy in the 90th section of the British North America Act by vesting the power of disallowance in the executive power of the Dominion, the Governor-General-in-Council.

The remarks made by the Hon. Edward Blake, as Minister of Justice, in his report of 11th of October, 1876, quoted in Dominion and Provincial Legislation, 1867 to 1895, at page 1043, are fully applicable to the present case. In that report, which was confirmed by the Governor-General-in-Council, it is said that "the unequal and discriminatory character of these taxes, and their injurious effect in the regulation of Trade and Commerce are very obvious." After calling attention to the express provisions of the British North America Act, by vesting exclusively in Canada the regulation of trade and commerce, the Minister of Justice said:—

"It is to be observed that that Act (the British North "America Act) vests in that Parliament (the Parliament of "Canada) the legislation on duties, customs and excise, and the "funds produced thereby. It was also provided that all articles "of the growth, produce or manufacture of any one Province "shall, from and after the Union, be admitted free as to each of "the other Provinces.

"The local Act now under consideration appears to the "undersigned by reason of its peculiar provisions, both as to the "claims of persons and the description of trade subject to taxa-"tion, to involve an attempt to regulate trade and commerce in "excess of the powers of a local legislature, opposed to the spirit "of the Union Act, in violation of sound principles of taxation, "and of mischievous tendency."

That report was adopted by Order-in-Council and the Act there in question disallowed.

The reasons for disallowance are much stronger in the present case, and it is respectfully submitted that a similar course should now be pursued.

NOT A BONA FIDE EXERCISE OF PROVINCIAL JURISDICTION.

From the above it follows that the present Act is not a bona fide exercise of Provincial jurisdiction, and in the report of the Minister of Justice, dated 22nd December, 1875, confirmed by Order-in-Council of the 29th February, 1876, in discussing the principles upon which the power of disallowance should be exercised, it is said:—

"There may be a provincial jurisdiction for a particular "purpose, exercised in fact though not in form, for the accom- "plishment of another purpose within Canadian jurisdiction.

See Dominion and Provincial Legislation, 1867-1895, p. 71.

A similar principle is pointed out by the present Chief Justice of Canada, at 2 S. C. R., at p. 109, in the following words:—

"However carefully the purpose or object of such an enact- "ment might be veiled, the foresight of those who framed our "Constitution has led them to provide a remedy in the 90th "section of the Act by vesting the power of disallowance of "Provincial Acts in the Executive Power of the Dominion, the "Governor-General-in-Council."

LICENSE FEES IN REALITY AN EXPORT DUTY.

This appears clearly from the provisions of section 10 and the last part of section 13, sub-section 1, and attention is called to the last words of section 10, referring to the said license fees upon ores which are smelted or otherwise treated within the Dominion of Canada, etc., that they or such proportion thereof as may be fixed by the Lieutenant-Governor-in-Council "shall be remitted, or, if collected, shall be refunded under such regulations as the Lieutenant-Governor-in-Council may prescribe."

The confusion which would be created in the present case is shown by the fact that the Dominion Parliament have already covered the same field by Federal Legislation in the Dominion Act, 60-61 Vic., chap. 17, assented to 29th June, 1897. If, therefore, the present Act is not disallowed, there will be a delegation by the Dominion Parliament to the Governor-General-in Council and a delegation to the Lieutenant-Governor of the Province of Ontario in Council, to deal with precisely the same subject. This is objectionable, and it is submitted that the appropriate remedy is disallowance.

LEGISLATION BY ORDER-IN-COUNCIL AN EVASION OF THE BRITISH NORTH AMERICA ACT.

The present Act virtually delegates the power of taxation and confiscation of mining lands and regulation of the smelting and refining industries, so far as nickel and nickel-copper ores are concerned, by order of the Lieutenant-Governor of Ontario in Council, and under the Constitution such Orders-in-Council are not subject to revision by the Dominion Government.

This is an evasion of the constitutional safeguard afforded by disallowance, and was made the ground for the disallowance of a British Columbia Act by the Dominion Government, as appears by the report of the Minister of Justice, dated 13th October, 1875. That report, at p. 1,038 of Dominion and Provincial Legislation, 1867-1895, says:—

"So long as local legislature keeps within its own hands "the division of the districts and the alteration of their bound- "aries, this Government has, by virtue of the power of dis- "allowance, some measure of control over such action, but "should such Act go into operation, no such control could there- "after be exercised here."

That is, by the Dominion Government. The Act there in question was disallowed, the said report being adopted by Order-in-Council. The reasons for disallowance are much stronger in the present case, because the Act there in question dealt only with municipal boundaries, whereas the present Act deals with much more important matters.

It is to be added that such a delegation of legislative power, especially upon the subject of taxation, is completely repugnant to the spirit of our Canadian Constitution, and if in practice such a delegation is sanctioned the power of disallowance may be wholly evaded.

SAW LOG CASE NOT IN POINT.

It has been urged that the present case is similar to what is known as the Saw Log Case, but it is to be observed that there is no foundation in fact for this argument. There the Province was dealing with its own property. In the present case the Province had parted in the most absolute way, as above shown, with all proprietary control over the lands and ores now in question. This is made clear by the quotation from the judgment in the Saw Log Case of Mr. Justice Moss, one of the Judges of the Ontario Court of Appeal.

He says (Smylie versus The Queen, 27 Ontario Appeal Reports, 192): "I see no reason for thinking that the Legis- "lature may not in respect of this property do what any sub- "ject proprietor might do when proposing to dispose of his "property."

The basis therefore of that dicision was that the property there being dealt with was the property of the Province, but it is an entirely different matter, the property has been granted unconditionally by the Province, and has in many cases passed into the hands of persons not resident in Ontario. This matter was discussed in the Toronto *Globe* of 11th April, 1900, where the well recognized principle was stated in the following words:—

"Had the minerals and mining lands been alienated uncon- "ditionally the Province could not now impose necessary obliga- "tions and taxes, for the mine owners would be in a position to claim immunity or compensation."

The mine owners who hold lands patented prior to the 4th May, 1891, do hold lands which had been patented unconditionally, and they are therefore in a position to claim immunity or compensation, and under the precedents the proper authority to grant such immunity is the Governor-General-in-Council, in whom is vested the power of disallowance.

DOMINION AND IMPERIAL INTERESTS PREJUDICED.

It is plain that if legislation such as the present is permitted, a precedent will be established for mischevious Provincial Legislation by Order-in-Council over which the Dominion Government will cease to have control but for which they will be responsible. The result will be that Dominion and Imperial interests may be greatly prejudiced.

The reasons for intrusting exclusive jurisdiction over such matters as the regulation of trade and commerce were well considered. If the present Act is not disallowed the efficiency of this necessary Federal control will be seriously impaired.

The present Act, if not disallowed within the time limited therefor, will enable the Ontario Government for the time being to frustrate, so far as nickel and copper ores are concerned, the policy of the Canadian Government, which has for its object the develoyment of trade with Great Britain.

It authorizes discriminition against British industry and enterprise and tends to compel British consumers of nickel to look to foreign sources for supplies of nickel.

In fact, since the passing of the present Act, the nickel mining industries of New Caledonia, Norway and other foreign countries have been greatly developed at the expense of Canada.

PRECEDENTS JUSTIFY DISALLOWANCE.

The precedents above referred to and others too familiar to render citation necessary, fully justify the exercise of the power of disallowamce in the present case.

The action taken by the Dominion Government with reference to the Quebec Mining Law, 54 Vic., chap. 15, is also relied on.

Sce Dominion and Provincial Legislation, 1867-1895, p. 440, section 1,426 of the Act there complained of, imposed on all mineral

properties a tax, therein styled a royalty, "of three per cent. of the merchantable value of the product of all mines and minerals."

As already shown, the reasons there alleged, namely, that the royalty was made applicable to lands which had been alienated unconditionally by the Province, exist in the present case.

And whereas, in the Quebec case only three per cent. was imposed, in the present case over one hundred per cent. is authorized.

NO PRESENT REMEDY IN COURTS.

This is not a case in which there is purely a legal question of *ultra* or *intra vires*, and, in any event, inasmuch as the Ontario Government and Legislature have formally declared that it is not in the public interest that the legislation in question should be enforced, it follows that there is no present remedy in the courts. On the other hand, the Act creates a cloud upon the nickel industry, and virtually a blanket charge or mortgage upon all nickel properties that may be worked, which should be removed.

The only available method of such removal is by the exercise of the power of disallowance.

The injury caused, not only to private individuals, but also to the trade and commerce of the Dominion, by the present Act has already been very great and will in the near future be much greater.

The presence of the Act upon the Statute Book will be a tremendous blow to the credit of Canada, and is very detrimental to the further investment of capital in Canadian enterprises.

The Act complained of is contrary to natural justice and equity, which the Governor-General-in-Council is entrusted with authority to disallow. To this authority, as pointed out by Chief Justice Draper, *re* Goodhue 19 Gr., 384, a corresponding duty attaches.

On these grounds, namely :—

1. That faith should be kept and the honour of the Crown maintained.
2. That the Act complained of amounts to virtual confiscation without compensation.
3. That vested interests are threatened.
4. That the Act complained of trenches upon Dominion jurisdiction.
5. That it is not a bona fide exercise of Provincial jurisdiction.
6. That the license fees authorized are in reality export duties.
7. That legislation by Order-in-Council, as proposed, is an evasion of the British North America Act.
8. That the Saw Log Case is not in point.
9. That Dominion and Imperial interests are prejudiced.
10. That the precedents justify disallowance; and,
11. That there is no present remedy in the Courts.

It is respectfully submitted that the Act complained of should be disallowed.

The Wetherill magnetic separator has recently been applied with success at Kalk-am Rhein, Germany in the separation of an ore containing galena, zinc, blende, and spathic iron, carrying as much as 12 per cent. of manganese, with a gangue of quartz. By ordinary mechanical concentration these could only be obtained an impure spathic iron, containing 15 to 22 per cent. of zinc and about 2½ per cent. of quartz. Using the Wetherill separator, the ore being crushed not to exceed 3 m. m. diameter, the blende concentrates showed 42 to 46 per cent. zinc, and the spathic iron, obtained as a separate product carried only 1 to 3 per cent. of zinc. The tension of the current was 65 volts, with 12 amperes. Each machine, with belts 14 inches wide, travelling 125 ft. per second, was capable of treating a little over 1 ton per hour, at a cost of 29 cents per ton.

COAL MINING AND TRADE.

The advent of Mr. Christopher Shields, the new general manager of the Dominion Coal Co, has stimulated both curiosity and activity in coal mining circles. It is fully realized that a much larger output than has yet been estimated is expected from the Cape Breton mines in the near future. When in Halifax recently Mr. Shields stated that the present capacity of the Dominion Coal Co.'s mines was 12,000 tons a day and that the intention is to reach 20,000 tons as soon as possible. It may not be out of place to utter just a word of warning on this subject, not at all in a pessimistic vein but solely in the best interests of the coal trade and dependent industries of Eastern Canada. Development is a good thing, and one of the mistakes of mine operators in the past has been the backwardness of development and consequent inability to cope with any increase in demand. In the light of the evidence given before the Board of Arbitration last month it is clear that the Dominion Coal Co. lost at least $1,000,000 in 1900 from this cause. We propose to say something later on the subject of the arbitration but it must be a matter of regret both in the interests of employers and employed that the mines after eight years' operation by the present company and the expenditure of more than $7,000,000, could not respond to the demand which for the first time in their history would have taken every ton that could have been supplied at a clear profit of at least $2 a ton. In a lesser degree the same thing is true of all eastern mines with the result that profits all round are far below what might have been expected with such prices as $3.50 and $4 ruling. All this is an argument for steady continuous development work in the full belief that sooner or later the boom time will come, as it always has done, and with it for those who are ready the golden harvest. Hitherto the trade of the world has always been subject to recurring cycles of prosperity especially affecting the coal trade. True, Canada, a non-exporting producer, (except to the United States) has not shared in the fabulous prices which at such times have ruled in the Old World, but things are changing, and it is not likely that in future booms we shall be outside the influences that make for high prices and excessive demand. This much may be deduced from recent events. How is this to be met? Not by mad speculation, and ill-considered exploiting of coal areas on every hand. There is not yet an assured market for more than a very moderate increase, say 20 per cent., on the production of last year. Such an increase would satisfy every requirement of the Canadian and American market and for anything in advance of this, an entirely new market will have to be found.

The possibility of exporting Nova Scotia coal to Europe was first ventilated in this column and since then the salient features of the scheme have frequently been discussed. It looks as if the discussion is about to bring forth fruit for, on good authority, we learn that the Nova Scotia Steel Co.—who have just bonded their properties to a London syndicate—are to be the pioneers in the exporting of coal to England as they were the first to send iron ore across the Atlantic. We understand that this feature has had considerable weight in the negotiations which have been conducted and is intended to form an integral part of the project. Other Nova Scotia mines are depending upon the possibilities of the same market, and while we stand by our previous statement that Nova Scotia coal can be delivered on the Thames at all times at $3.50 a ton, it would be well to secure definite contracts before any large capital outlay is expended on this hypothesis. There is no doubt the market is there but it has to be captured and the most direct way to ensure this is that adopted by the Nova Scotia Steel Co., the enlisting of British capital. There are many large coal factors in London, to say nothing of corporations like the Railway and Gas Companies to whom the certainty of a good coal at $3.50, year in and year out, would be a great boon, and once the matter can be demonstrated a steady trade can be established, but

there are many problems to be solved first, including careful selection, good screening, and special transportation, and, in the meantime, reckless and indiscriminate expenditure on the supposition that all is over but the shouting, in order to capture the European market, is to be deprecated. Development had better take the direction of more extended underground recoveries rather than the erection of costly surface plants which may not be required for years to come, or the opening up of difficult and uncertain seams which may have to be abandoned, like the Emery, as hurriedly as they are taken up.

Everyone interested in the prosperity of Canada realizes that a great opportunity now presents itself in the coal and iron trades of the Maritime Provinces and that upon the judicious handling of these enterprises, at the present critical stage, our future prospects entirely depend. We have long called for English capital, and now that there are many evidences of its arrival it behoves us to act with moderation and fairness if we would have it stay and increase. For this reason we deprecate rash development, over-production, and above all, extortionate demands for coal areas. The old country motto "feel your way as you go" is essentially the motto for the Nova Scotia coal trade.

The decision of the Court of Arbitration in the wages dispute between the Dominion Coal Co. and their workmen comes as no surprise to those who were acquainted with the trade conditions of last year. Briefly stated it is as follows:—"True the coal trade of Nova Scotia has been booming and prices in the open market have ranged throughout the year from $3 to $4 a ton, but not more than 15 p.c. of the output was sold at advanced rates owing to the heavy demands of the contracts, consequently the company benefited very little by the advance, and the margin of profit was so small that the company could not afford to pay the 10 p.c. advance asked for and it is therefore not allowed." This is a decision which however uncertain on equitable grounds will commend itself to common sense and all parties concerned are to be congratulated on an amicable settlement of the dispute and the loyal acceptance of the decision by the miners. Incidentally, also, the Province may be congratulated on the possession of such an excellent and practical Board of Arbitration.

Most of the evidence upon which the verdict was based was of course given under a bond of secrecy but, with the consent of the coal company, a few most important and significant figures were given to the public. Chief among these is the average selling price for 1900 which, for reasons stated above, only reached $2.35, and the fact that the profit was only ½ a cent more than in 1899 when the selling price was about $1.75. The increase in price was practically absorbed by the advance in wages granted during the year and the heavy increase in dead work and charges. It may be a little hard on the Cape Breton miners that they have to sit down to a lower rate of wages than the miners on the mainland, but in the end this is better than crippling the industry by exacting more than the financial position justifies, and no one who is acquainted with the vastly improved condition of the Cape Breton miner during the last few years, will question the wisdom of a counsel of moderation at the present time.

A suitable location on the Point Aconi areas has been selected for the Nova Scotia Steel Co. by Mr. H. S. Poole, and during the present season sinking operations will be commenced. This is one of the most extensive and promising coal districts in Cape Breton and can be developed within a few years to any extent required.

The borings conducted on the McVey areas have not been quite as favorable up to date as was anticipated. Although the bore-hole near West Brook is down 600 feet no seam of importance has yet been reached. The strata passed through consists chiefly of sandstone and shales. At 500 feet a 2-ft. seam of coal was met with. It is not unlikely that the drill will shortly be moved several miles to the east.

Rev. John Murray has been more fortunate and has struck a good seam of coal, 6-ft. thick, on the old Cow Bay road, and, if it is not interfered with by the anticlinal, it will cover a large area.

We were rather startled the other day, though not unpleasantly, to find a Nova Scotia worthy who has hitherto confined his wanderings to the East, breaking up new ground in the far West. No one is better fitted to take a bird's eye view of a new country especially where there are black diamonds to be tested. What with recent travels in the Old World and the United States, our friend should by this time be pretty well posted on trade and labour problems, and we hope he will give the Government at Ottawa the benefit of his impressions whilst in British Columbia. They would certainly be interesting and might be valuable, especially if he adopted the invariable outspokenness and frankness of "the chiel amang ye takin' notes."

Nova Scotia Steel Co.

Just as we go to press we learn that the large and valuable properties in Nova Scotia and Newfoundland so successfully exploited for many years by the Nova Scotia Steel Company have passed into the hands of a British Syndicate. Particulars of the deal have not yet been made public. The profits of the Nova Scotia Steel Company for the year ended 31st December last were $655,272.86. To which may be added the balance to credit of profit and loss account carried forward, amounting to $47,883.38, or a total of $703,156.24.

This was distributed as follows:—

Dividend Paid on Preference Stock 10th September, 1900, 4%	$ 41,200 00
Interest on Mortgage Bonds	45,726 00
Reserve for Bad Debts	10,000 00
Depreciation	20,000 00
Plant Renewals	200,000 00
4% Dividend on Preference Stock, payable March 9th, 1901	41,200 00
10% Dividend on Ordinary Stock, payable March 9th, 1901	103,000 00
Balance carried forward at Credit of Profit and Loss Account	242,030 24
	$703,156 24

The following method for the assay of the gold precipitates from the zinc boxes in the cyanide process has been described by Charles H. Fulton and Charles H. Crawford, of the South Dakota School of Mines, and recommended as giving more reliable results than either the scorification or crucible method. One tenth assay ton of the precipitate is treated with 20 c.c. concentrated sulphuric acid diluted with 60 c.c. distilled water. Boil one hour, cool, and dilute to 100 c.c. Add 75 c.c. normal salt solution, and 20 c.c. of lead acetate solution. Allow to settle one hour, filter, wash and dry the precipitate. Burn the paper off at a low heat, and scorify until half covered over in the scorifier. Pour; and cupel the button. Thirty to forty grammes of lead are used.

The well-known difficulties in soldering aluminum have apparently been overcome by W. C. Heraeus of Hanan, Germany, who has applied the method known as autogenous soldering, using no solder or flux of any kind. The surfaces to be joined are cleaned, laid together, heated carefully to the temperature at which the metal commences to soften, meanwhile hammering together to make a perfect weld. The success of the method depends upon maintaining a perfectly uniform heat. If too high the metal becomes granular, commencing to oxidize, which defeats the effort to weld the surfaces.

SECRETARY'S REPORT

(a) Upon the Work of the Institute.

(b) Reviewing Mining Progress in Canada during 1900.

MR. PRESIDENT AND GENTLEMEN :—

It is gratifying to be able to report the continued growth and prosperity of the Institute during the year.

MEMBERSHIP.

Notwithstanding a number of resignations, owing to members leaving the country and from other causes, our membership has increased to 323 (including fourteen student members) as compared with 277 in 1899 and 192 in 1898, when the Institute was reorganized under its present Constitution. That the membership embraces the best elements in the profession and industry of mining in Canada may be seen by a reference to the recently published list of members; its wide distribution and thoroughly representative character is shown in the following comparative table :—

Province or Country	At 31st Dec., 1898	At 31st Dec., 1899	At 31st Dec , 1900
Nova Scotia	16	16	19
New Brunswick	2	1	2
Quebec	66	77	77
Ontario	44	68	91
British Columbia	42	65	71
Newfoundland		1	2
North West Territories	5	5	5
Great Britain	4	9	7
United States	11	17	26
China	..	1	..
Honolulu	..	1	1
Spain	..	1	2
S. Africa (serving with colors)	..	..	4
Alaska	..	..	1
Mexico	..	..	1
Students	2	15	14
Dead	2	4	6
Totals	192	277	323

It is also pleasing to observe that, while we lose a number of members by resignations going into force at this date, our strength will be considerably increased by the acquisition of the new members whose election to-day you will be asked to confirm.

MEMBERS REMOVED BY DEATH.

We have again to deplore the loss of six members by death during the year :—

Mr. James King, of Quebec, was removed under particularly distressing circumstances, having been drowned early in the summer by a boating accident. By his death the Institute has lost one of its oldest and most valued members, a gentleman who took a lively interest in its affairs, and who had done much to advance the welfare of the mineral industry, particularly in his own native province, where he was prominently identified with the production of asbestos.

Dr. Carl Hoepfner, Hamilton, having only been a short time in the country, was not so well known, but he had achieved some reputation as a metallurgist and as the patentee of a number of processes for refining and treating nickel, zinc and other metals.

Mr. Ernest Bielenberg, of Greenwood, and Mr. Barclay Stephens, of Montreal, will be remembered as the promoters of a number of mining enterprises in British Columbia.

Mr. James Foley, Montreal, was the promoter and chairman of the Petroleum Oil Trust Limited, and other undertakings having for their object the Exploitation of the Gaspé Oil Fields.

And, gentlemen, I regret to say, no later than last week we have sustained a severe—I may say truly, a national loss, in the sudden and untimely demise of the honoured head of our Geological Survey, the late Dr. George Dawson, C.M.G., one of our Vice-Presidents, and a charter member of the Institute. As Dr. Ami will present a memoir of the late Dr. Dawson at a later session it will be unnecessary for me to refer here to the eminent services rendered by the deceased gentleman towards the development of the mineral and natural resources of the Dominion.

MEMBERS IN SOUTH AFRICA.

Four members, Major Hamilton Merritt, Lieut. J. Edwards Leckie, Mr. Thomas Brown and Mr. L. H. Webber were absent from Canada serving the Empire with the colours in South Africa.

MEETINGS AND PUBLICATIONS.

Our annual meetings were held as usual in Montreal during the first week in March and were exceedingly well attended, not only by local members, but by many mining men from distant sections of the Dominion.

The papers, discussions and business transacted have been fully published in the third volume of our Journal of Proceedings.

Five meetings of Council, and numerous meetings of Special Committees, have been held, and the attendance at all of these has been distinctly satisfactory.

SUMMER EXCURSION.

In August, the Institute had as its guests the American Institute of Mining Engineers and in conjunction, and with the hearty co-operation of the officers and members of the Mining Society of Nova Scotia, we were enabled to carry out a most elaborate, interesting and highly enjoyable series of excursions through the most important mining and industrial sections of Eastern Canada and Newfoundland.

As the particulars of these excursions, meetings and entertainments will be fully described in the next volume of the Journal of the Institute, it will only be necessary to say that the chief points visited were Sherbrooke, Thetford Mines, Quebec, Sydney, Louisburg, the Bras D'Or Lakes, New Glasgow, Westville, Stellarton, Halifax, Waverley, Old Sydney Mines, St. John's, and the Bell Island red hematite mines in Newfoundland, and that at every point touched by the excursion the members and their guests were welcomed and entertained upon the most lavish scale.

The heavy costs of transportation involved in an excursion covering so vast a territory were met by a Grant of $2,000 from the Dominion Government, $500 contributed by the Mining Society of Nova Scotia (being half of an amount given to that organization by the Government of Nova Scotia) and $250 from the Quebec Government. We were also indebted to the Intercolonial Railway, the Dominion Coal Co., and Mr. R. G. Reid of the Newfoundland Railway for special concessions.

Owing, however, to the impossibility of securing rolling stock in Canada, at that busy season of the year, we were compelled to bring the sleepers, dining car, and equipment comprising the Institute's special train from distant points in the United States, involving an expenditure for mileage which was not provided for in our estimates, and creating a small deficit which the Treasurer has been compelled to charge against the ordinary income of the Institute during the year.

The publication of a handsomely illustrated Souvenir Volume describing the mineral industries of the territory covered by the

excursion was greatly appreciated by our guests, and although a large number of copies were printed in excess of the requirements of the party, the demand for copies of it has been so great that we could easily have disposed of twice the quantity.

Legislation.

On 9th April, the Hon. Mr. Davis, Commissioner of Crown Lands, introduced in the Legislature of Ontario "An Act to Amend the Mines Act." Section 7 of this bill provided :—

> "Every person carrying on the business of mining for any of the said ores in this Province shall pay a tax upon the gross quantity of the ores or minerals mined, raised or won during the preceding year from any mine worked by him to be paid to the Treasurer of the Province for the use of the Province at the following rates, or such less rates as may be substituted by proclamation of the Lieutenant Governor, namely :—
>
> (*a*) For ores of iron, fifty cents per ton;
> (*b*) For ores of zinc, $5 per ton, or $15 per ton of metal contents if partly treated or reduced;
> (*c*) For ores of copper, $2 per ton, or $25 per ton of metal contents if partly treated or reduced;
> (*d*) For ores of nickel, $10 per ton, or $60 per ton, of metal contents if partly treated or reduced;
> (*e*) For ores of copper and nickel, $7 per ton, or $20 and $50 respectively per ton of metal contents of copper and nickel if partly treated or reduced;
> (*f*) For all other ores or minerals, such rate as may be from time to time imposed by Order-in-Council, but so as not to exceed five per cent. of the selling prices thereof in a free market."

The unwisdom of this proposed legislation will be readily appreciated by members of the Institute conversant with the conditions affecting mining undertakings ; it imposed taxes absolutely ruinous and prohibitive; the very menace of them, if embodied in a statute, would be sufficient to destroy confidence and prevent investment.

Its unconstitutionality will be understood when it is stated that Section III of the 'Mines Act' of the Province had very distinctly repealed and exempted mineral lands patented prior to 4th May, 1891, from "all royalties, taxes or duties." In other words it was identical to the historic Mercier Mining Act which sought to confiscate mineral property in Quebec which had been alienated from the Crown unconditionally. Other provisions of the Bill were equally obnoxious.

The unexpected character of this proposed legislation, (it had passed its first reading in the Legislature before we became acquainted with its provisions), rendered immediate action imperative. There was no time to call the Council together, but in response to the urgent appeal of many of our members, whose interests were vitally affected by the Bill, I went to Toronto and co-operated with a large body of Ontario mining men, in the effort to have the Bill withdrawn or modified. After many meetings and interviews, much lobbying, and a considerable expenditure of time, we were so far successful in having the Bill pass the Legislature greatly modified in its original provisions.

The special tax of 50 cents per ton on iron, $5.00 per ton (or $15.00 per ton of metal contents if partly treated or reduced) on zinc ores; $2.00 per ton (or $25.00 per ton of metal contents if partly treated or reduced) on copper ores; and the general tax on "all ores or minerals" at a rate to be fixed from time to time by Order-in-Council, not exceeding 5 per cent of the selling price were struck out; but the Legislature still reserves the right to impose a "license fee" of $10.00 per ton or (or $60.00 per ton if partly treated or reduced) of nickel; and $7.00 per ton (or $50.00 per ton if partly treated or reduced) on ores of copper and nickel.

The Act as adopted by the Legislature is still open to most grave objection on constitutional grounds and, if ever enforced, its legality will be tested in the Courts.

At a meeting of the Council held in Montreal on 9th July, my action in this matter was unanimously endorsed and the expenditure involved in connection with the work was approved.

Library and Reading Room.

The collection of works on mining and metallurgical practice, books of reference, exchanges from kindred societies, magazines and papers, maps, plans and photographs in the Library and Reading Room has been considerably extended during the year and an additional bookcase provided for their accommodation.

It has been suggested that in view of the comparatively limited accomodation provided for this collection in the Windsor Hotel, an endeavor should be made to secure larger premises elsewhere and there has been some correspondence with the Canadian Society of Civil Engineers with the object of ascertaining upon what terms the Institute might be given the use of a portion of their new building on Dorchester Street.

Other Business.

During the year the Secretary has replied to many enquiries asking for information concerning the mining industries of different sections of the Dominion.

MINING PROGRESS IN 1900.

Supplementing these notes on the work of the Institute it may not be inappropriate to refer to some of the salient features of mining enterprise and to the progress and prosperity of the mining industries of the Dominion during the past year. At this early date it is, of course, quite impossible to do more than make an approximate estimate, but from returns courteously furnished me by the managers and secretaries of our mining companies, by the officers of our Provincial Mining Bureaus and other official sources, it is quite certain that we can congratulate ourselves upon the most successful year in the history of mining in Canada. A conservative estimate indicates that the value of our mineral output during the year 1900, when returns are finally completed, will be not less than $67,000,000 as compared with $47,275,512 in the year 1899.

Roughly speaking we may distribute the production as follows :—

Yukon, N. W. Territories and Manitoba	$28,000,000
British Columbia	16,000,000
Ontario	9,288,424
Quebec	3,000,000
Nova Scotia and New Brunswick	11,000,000
Or in round figures	$67,288,424

[Note.—Since this report was presented, the Mines Section of the Geological Survey has issued a preliminary statement, subject to revision, estimating the mineral production of the year at $63,775,090, but, as quite a number of items, such as coal, iron and steel, nickel, asbestos, and mica, are manifestly under-estimated, I see no reason to alter my estimate.]

BRITISH COLUMBIA.

The statistics for the year are not quite complete but are sufficiently advanced to enable a very fair idea to be formed of the progress made last year which may be briefly summarized as follows :—

Tonnage ore mined	90%	increase.
Gold Production	20%	"
Silver "	35%	"
Copper	20%	"
Lead	200%	"
Output of Lode mines, values	50 to 60%	"

The statistics of coal have not yet been handed in and can only be estimated. The Vancouver Island Collieries are expected to have at least held their own, while the output from the Crow's Nest Pass has

risen from about 69,000 tons in 1899 to over 230,000 tons in 1900 and this increase of 161,000 tons will about represent the increase in the total production.

For the following notes, I am indebted to the courtesy of Mr. W. F. Robertson, M.E., the Provincial Mineralogist :—

Placer Mining.—Placer Mining proper has this year decreased very considerably. Atlin, our chief producer of last year, has been skimmed of the cream as far as the placers are concerned and is at present in the transition stage of shifting over to Hydraulics. Several hydraulic plants have been installed this past year but as yet, as might be expected, have not made any considerable output.

The ground in Atlin is, on the average, too deep for placer mining but is in many ways ideal for hydraulics and, with the values known to exist, should prove very profitable. The question of water will, however, be serious as there is not a sufficient supply to go round and consequently only a portion of the many leases can be worked at one time. The placer returns from the north central part of the Province are this year smaller than usual, owing to high water in the spring and the great demand for labour caused by the building of the telegraph line to Dawson.

Hydraulics.—The Cariboo District is showing that the diminished output of placer gold in recent years has not been due to the absence of that metal, simply to the fact that it lies too deep for placer work. It is now beginning to be recovered by the big hydraulic companies operating there, notably the Consolidated Cariboo Hydraulic Mining Co. which is further advanced in its work than any of the other companies. The output of gold from this district in 1900 will reach a point not touched for 14 years, certainly an encouraging sign. On the Coast a number of hydraulic leases have been taken out of beach deposits of black sand and the operations so far have yielded well, more than covering the costs of installation of plants and promising well for the future.

Dredging —The dredging problem has not yet been solved in British Columbia. The river bottoms have been proved to carry gold in quantity much greater than has been successfully worked in New Zealand and elsewhere, but the "conditions," viz : boulders and swift water, combined with the fineness of the gold, have yet to be successfully overcome ; here is a tempting field for invention.

Lode Mining.—We have had our troubles of one sort and another, but 1900 will show a total production from the lode mines this year that will represent an increase of between 50 and 60 per cent. over 1899, while the tonnage of ore mined has increased over 90 per cent. showing that the lower grade propositions are beginning to be more generally worked, thanks to the gradually increasing transportation facilities.

Lead.—The feature of the year is the increased lead production, which is over 200 per cent. higher than that of '99, and the fact that East Kootenay has this year carried off from the Slocan the banner as the chief lead mining district, producing nearly 60 per cent. of the total output of that metal.

Silver.—An increase in the production of silver has naturally followed that of lead, as the two are so closely associated in British Columbia. This increase will be nearly 70 per cent. over '99, not as great as lead shows, for the reason that the silver contents of the East Kootenay galenas is not as high as those of the Slocan, which district has heretofore been our chief producer.

Copper.—Copper will show an increase of nearly 20 per cent. over last year, due to the Boundary District becoming a producer. The production of this District would have further increased our percentage of gain had it not been offset by a falling off of the production of the Nelson District and the materially lower copper assay value of the Rossland Ores.

Lode Gold.—The production of lode gold will show an increase of some 20 per cent. over 1899, due largely to the output of the Nelson District, which has been doubled this year, an increase tonnage in the Rossland Camp and the production of the Boundary District.

YUKON TERRITORY.

The output of gold from the Yukon during the year was not less than $25,000,000, as follows :—

Received Dust and Bullion, Government Assay Office Seattle.....	$16,946,437 08
Purchased by U. S. Mint and Selby Smelting Co., San Francisco during eleven months 1st Jan to Nov. 30th.	5,395,000 00
Add dust not reported and dust used in the territory, as a medium of exchange : say.....	3,000,000 00

The figures for previous years are : 1897 $2,500,000.00 ; 1898 $10,000,000.00 and in 1899 $17,500,000.00. The total sum collected by the Dominion Government up to 1st July, 1900 for Royalty on the gross output of placer claims, after deducting the exemption allowed by the regulations was $1,596,277.38. Of this amount the sum of $733,041.04 was collected during the fiscal year ended 30th June last, as follows :—

Dawson	$204,369 79
Grand Forks.....	24,462 49
Gold Run.....	49,036 95
Hunker Creek.....	40,113 90
Dominion Creek	94,749 06
Sulphur Creek.....	20,308 85
Total.....	$733,041 04

So far gold in payable quantities has been found in the bottoms of the valleys, or on terraces along the sides of these valleys. No rich quartz veins have been found, but it is in the highest degree probable that, where gold is found scattered in such abundance through the alluvial deposits, the veins or stringers from which it has been derived will be discovered, and that some of these veins or stringers, or aggregations of them, will be sufficiently rich to pay a profit over working expenses for extracting the gold

Coal.—While the existence of the deposits of lignite in the Yukon Territory is well known, many of our members may not be aware that an effort has begun to exploit them commercially. As a matter of fact last season several thousand tons were mined and transported to Dawson, and 531 tons were exported, in September, to United States Territory.

One of the mines is operated by the Alaska Exploration Company on Rock Creek about seven miles from the point where it joins the Klondike river, and about twenty miles from Dawson. The seam averages from four to eight feet, being about six feet thick at a depth of 175 feet and is opened by a series of tunnels penetrating the seam for 400 feet in a direct line. Although but twenty-five miles from the centre of the mining district of Bonanza and Eldorado, and within ten miles of Hunker Creek, the cost of transportation to these points and to Dawson has varied all the way from fifteen to twenty-five dollars per ton. With the opening up of the country these costs of course will be very greatly reduced.

The other working mine is operated by the North American Trading and Transportation Company, on Cliff Creek, which enters the Yukon sixty miles below Dawson, and ten miles below Forty Mile Creek. It is situated a mile and a half up the Creek and is connected with the Yukon by a tram line over which the coal is delivered into the bunkers on the company's wharf and then loaded into river steamers for delivery at points on the Yukon river. The seam is reported to be eight feet thick and is opened by four tunnels, the shortest of which is 200 feet and the longest 450 feet. Last season the mine produced 3,000 tons, the whole of which found a ready market.

Dredging in the Yukon and North West Territories.

During the fiscal year ended 30th June last, leases have been granted by the Dominion Government to dredge for minerals in the Yukon Territory covering 1,313 miles and for the same purpose in the North West Territories covering 961.75 miles. Gold dredging on the North Saskatchewan River is still in an experimental stage.

During the past season the large dredge of the Saskatchewan Gold and Platinum Proprietary Limited has only been in partial operation —owing to the necessity of making certain necessary changes in the machinery. When, after many delays, due to the late arrival of the machinery from England, the dredge was put into commission, it is understood, though not yet officially announced, that the result was highly satisfactory showing a saving of from 25 cents to 30 cents per cubic yard.

The Saskatchewan Gold and Platinum Proprietary and the Alberta Gold Dredging Co. Ltd., have each a dredge approaching completion so that there will be three ladder bucket dredges at work on the river during the coming season. The dredges of the Loveland Co., the Evans Co., and one or two other concerns worked profitably during the year, but have only a limited capacity and are merely "dipper" dredges. As these are private enterprises they do not issue statements of results. The Star Gold Dredging Co., Ltd., contemplates building a large dredge of the New Zealand type.

To those of our members who are engaged in this industry, the following figures showing the profits realized last year from gold dredging operations in New Zealand will be of interest :—

"During the month of October ten dredges in Otago paid in dividends the sum of £8,135 while the dividends declared and paid by twenty-seven working Otago dredges for nine months, from January 1st to September 30th, 1900, are £76,118 on a capital of £195,652 which gives a return equal to 39 per cent. for nine months only. From January 1st to November 20th, 1900 there has been gained 56,533 oz. 8 dwt. 3 gr., which, at 77 s. per oz., is equal (roughly) to £217,625. For forty-six weeks the average number of working dredges has been thirty-four. The working expenses of each one, at £50 per week, are equal to £1,700. The weekly profit so far has equalled £3,031 (approx.). There were, at the end of October, thirteen dredges with a capital of £97,500, working, which so far this year (1900) have not paid any dividends. The amount invested in working dredges equals: Paying dividends £195,652, not paying dividends £97,500; total, £293,152. Taking declared dividends £76,118 to capital of all working dredges, £293,152 the return for nine months only is equal to 26 per cent."

ALBERTA.

The output of coal in the territories during the year was: Bituminous coal 304,000 tons; Anthracite coal 17,500. There was a slight falling off in production at Lethbridge the output of the Alberta Railway and Coal Company being 181,801 tons as compared with 192,889 tons in 1899. The H. W. McNeill Company also report a decline in the output of their collieries the production for the year being. Canmore Colliery 80,000 tons; Anthracite Colliery 18,000 tons.

It is not unlikely that before another year has passed the railway from Lethbridge to Great Falls will be made to standard gauge, in which case it is probable a large export trade of this Anthracite coal will be built up with Montana, Northern Idaho and Eastern Washington. The formation of a number of new companies indicates a probability of a very considerable development in the near future of the coal fields of Alberta along or near the line of the Crow's Nest Pass Railway.

ASSINIBOIA.

The production of Lignite at Roche Percee and Coal Fields will show an increase over previous years. As the workings extend the quality of the coal is found to improve and its sale is rapidly extending among the settlers of this Province and in South Western Manitoba.

MANITOBA.

A large number of mining claims have been recorded during the year in the district lying adjacent to the western boundary of the Province of Ontario, and several gold mining properties are being opened up. The gypsum deposits situated in the district lying north of Lake St. Martin in Townships 32 and 33, Ranges 8 and 9 West, are being rapidly staked out. The Manitoba Union Mining Company, composed of Canadian and American capitalists, have staked out a large area of land valuable for this commodity and purpose developing the claims at an early date. It is their present intention to place a reduction mill at Portage Bay on Lake Manitoba and to construct a tramway from that place to the mines.

Coal Markets in Manitoba and North West Territories.

The Crown timber agent at Winnipeg has furnished the following statement of the consumption of coal at points in Manitoba and as far west as Regina, which can be taken as approximately correct :—

American Anthracite	32,700	tons.
Canadian "	11,000	"
American soft	3,500	"
Canadian Galt	9,500	"
Souris Lignite	34,000	"

The following prices were obtained during the years 1899 and 1900, as shown hereunder :—

	1899 Per ton.	1900 Per ton.
American Anthracite, f. o. b. at Winnipeg	$7 75	$9 50
Canadian " " " "	6 75	9 00
American soft, f. o. b. at Winnipeg	6 00	7 00
Canadian Galt, " " "	.....	7 50
" Souris, " " Souris	3 75	3 75
Souris Lignite, " " Brandon	3 20	3 20
" " " " Regina	3 20	3 30
" " " " Melita	2 75	2 60
" " " " Moosejaw	3 00	3 10

ONTARIO.

Gratifying progress marked the year's operations in Ontario the total value of the mineral production being estimated at $9,288,424 as compared with $8,789,901 in 1899.

Copper and Nickel.—The feature of the year was unquestionably the notable expansion of the copper and nickel mining and smelting industries which have now assumed a leading position among the metalliferous mining enterprises of the Dominion.

Fifteen years ago when the members of the Canadian Copper Company pluckily invested their capital and commenced their pioneer work of development in the region, Sudbury was a barren and unhospitable region. To-day, owing to mining, and entirely dependent on it, it has grown to be a prosperous community, having a population in excess of 6,000 people, well housed, having excellent churches and schools, a good electric lighting system, a well managed hospital and a water works and drainage system equal to the demands of the people. 1,500 persons, miners, mechanics, furnace men, labourers, teamsters, etc. find employment at the mines. One company has spent in the district no less a sum than $2,774,000 in wages and over $4,000,000 in machinery, tools and supplies purchased in Canada and freights over Canadian railways. Add to these the very large sums expended during the year past by the Mond Nickel Company, the Canada Mining & Metallurgical Company, and other operators in this region and one realizes the vast importance of this great industry not only to the Province of Ontario but to the whole Dominion.

It has been stated by those interested parties who, to benefit themselves and their schemes, have been clamouring for the imposition of export duties, and other foolish taxation on these ores, that at present Canada is receiving less than 28% of the market value of the metal contents of this production. What are the facts? During the year 1900 there were produced from the mines at Sudbury 21,518 tons of copper nickel matte, in the production of which $1,050,000 were expended on Canadian labour and supplies, or an amount equivalent to 72 per cent. of the selling price of these metals. It may be further stated that large concentrating works are now nearing completion at Copper Cliff, whereby the percentage of values of the metals remaining in Canada will be further increased to 85 per cent. or 90 per cent. of their market value. These works are expected to be in operation by the 1st of May this year.

Among the year's additions to the list of active producers in this industry may be mentioned the extensive new works of the Mond Nickel Company at Whitefish, the operations of the Canada Mining and Metallurgical Company at Massey, the Bruce Copper Mines of Ontario, Ltd., re-opening and erecting an important concentrating plant at Bruce Mines, on the north shore of Lake Huron, and the Rock Lake Mining Company, in the same vicinity. Nor must we overlook the opening up of the Gertrude Nickel property in the township of Creighton by Mr. F. H. Clergue and his associates, for it is from this mine that they propose to draw the supplies of nickel for the manufacture of ferro-nickel and nickel steel at their large establishment now under construction at Sault Ste. Marie. The Frasch process for refining nickel and other metals, about which certain Hamilton promoters were so enthusiastic a year ago does not appear to have materialized, beyond the stage of laboratory experiment.

Iron.—The magnetite mines of Eastern Ontario have been pumped out and overhauled, and a number of them have been producing and shipping ore, some of which went to the blast furnaces at Hamilton and the remainder to smelters south of the line. The production of Iron Ore in Ontario was 16,911 tons, a very large increase over the previous year, mainly due to the opening up of the Helen hematite mine in Michpicoton by The Lake Superior Power Company.

The body of ore in the Helen mine is a very large one, doubtless containing many millions of tons, and the quality is good, though non-bessemer, running pretty uniformly about 55 or 57 per cent. of metallic iron. The bulk of the output for 1900 was carried by steamer to the new blast furnace built by the Canada Iron Furnace Company at Midland, and blown in December last. A sample cargo was sent to Ashtabula, and Mr. Clergue is credited with the intention of entering into competition with the mines of the Messabi and Vermillion ranges in supplying the furnaces of Cleveland and Pittsburg, in spite of the duty of 40 cents per ton. The Helen mine was discovered in 1897 and but little work done on it until after it passed into Mr. Clergue's hands in 1898. Since that time a railway twelve miles long has been built, ore docks constructed, steamers brought from England to carry the ore, and next season will probably see half a million tons taken from the mine. The Midland Furnace makes the third in operation in the Province, the other two being at Hamilton and Deseronto. At both Hamilton and Deseronto, the ores used have been chiefly from the American side of Lake Superior but since an abundant supply of equally good ore has been uncovered at Michipicoton, it is quite probable the wants of the furnaces will be supplied from our own Province. New Blast Furnaces are being projected at Collingwood and Kingston.

I am indebted to the Director of the Bureau of Mines for the following statistics:—

		1900	1899	1898
Ore Smelted	tons	100,692	110,036	77,023
Scale and mill cinder	"	13,092	10,004	8,614
Limestone for flux	"	.....	25,301	13,799
Coke for fuel	"	59,345	74,403	50,407
Pig Iron Product	"	62,386	64,749	48,253
Value of Product	$	936,066	808,157	530,789
Wages for Labor	"	97,915	79,869	61,476
Average workmen	No.	419	200	130

Gold Mining.—The past year has witnessed a complete collapse in the production of gold in the north western section of the Province and most of the mines in the Lake of the Woods and Rainy River districts from which, a year or two ago, so much was expected, are shut down. It can be safely said that this failure is due neither to lack of good properties nor to lack of capital to exploit them. Over capitalization, ten cent stock manipulations, the greediness of promoters, unskilful labour, and, perhaps more than any other, grossly incompetent management are prominent factors which have brought about this unfortunate and deplorable depression.

In contrast to the falling off in production in the North-Western sections of the Province it is gratifying to note the activity in the development of gold mining enterprise in Eastern Ontario.

The Deloro mines, in Marmora township, Hastings County, operated by the Canadian Gold Fields Limited, have made sound progress both in the establishment of a successful plant for gold extraction and in under-ground development. It is worthy of remark that about 40 tons per month of White Arsenic, quite equal to the best English and German grades, is being produced by this company as a bye-product. 125 persons are employed. Extensive mining and milling operations are also being conducted by the Cordova Exploration Company, Limited, another English Company, at the Belmont mine, in Peterborough County. This company employs 130 men. The Atlas Arsenic Company, the Sophia, and other properties, are also being worked in this section.

Graphite.—This mineral is being mined profitably, and on a fairly large scale, in the township of Brougham, Renfrew County, by the Ontario Graphite Company, the output realizing a good price from consumers in the United States.

Other Minerals.—The output of zinc, mica, petroleum, natural gas, silver, pyrites and structural materials also contributed to what has been on the whole, a year of substantial progress in mineral production in Ontario.

Statistics.—Mr. T. W. Gibson, Director of Mines for Ontario has courteously furnished the following official statement of the mineral production of the Province during the year:—

The total value of the mineral output of Ontario for 1900 was $9,288,424; the number of workmen employed in the industry 11,109 and the amount of wages paid $3,364,400. Following are some of the principal items:—

	Quantity.	Value.
Building stone	.....	$ 650,342
Cement ..... barrels.	432,154	698,015
Lime ..... bushels.	3,893,000	544,000
Drain Tile ..... No.	19,544,000	209,738
Brick & Terra Cotta ... No.	254,701,600	1,520,959
Petroleum ..... Gallons.	23,381,783	1,869,045*
Natural Gas	.....	392,823
Salt ..... tons.	66,588	324,477
Mica ..... "	609	81,550
Iron Ore ..... "	90,302	111,805
Pig Iron ..... "	62,386	936,066
Steel (open hearth) ... "	2,819	46,380
Nickel ..... "	3,540	756,626
Copper ..... "	3,364	319,681
Gold ..... ounces.	18,767	297,861
Silver ..... "	160,612	96,367

* Value of Products, viz., illuminating oil, lubricating oil, etc., *not* value of Crude.

PROVINCE OF QUEBEC.

Asbestos.—Mining in this Province was chiefly remarkable for the flourishing condition of the Asbestos industry. A strong market and a considerable advance in prices for all grades of fibre created an activity at the mines in the Eastern Townships unprecedented in the history of Asbestos production in Canada. Properties which had been shut down for years were reopened, large expenditures were made in

re-equipment, expensive modern milling plants were installed, or are under construction, and, notwithstanding an advance of 25 per cent. in wages the labour market was, and is still, inadequate to the requirements of the industry.

From returns furnished by the mines and railway companies the shipments from Thetford, Black Lake, East Broughton, Ottawa County and Danville, during 1900, will approximate in round figures 23,251 tons of all grades of asbestos, and nearly 7,000 tons of asbestic, estimated on the most conservative basis, to be of a value at the mines of not less than $1,000,000. The shipments over the Quebec Central Railway increased from 13,898 $\frac{1490}{2000}$ tons in 1899 to 19,970 $\frac{265}{2000}$ last year, as follows:—

From Thetford Mines	31,254,700 lbs.
" Black Lake	6,896,565 lbs.
" East Broughton	1,789,000 lbs.
Total shipments via Quebec Central Ry.	39,940,265 lbs.

During the year 1899, if we may believe the returns published by the Mines Section of the Geological Survey, the production was valued at $483,299.

Iron.—The iron industry will also, we believe, show increased values over previous years. Charcoal pig iron of superior quality was manufactured by the Canada Iron Furnace Company, at Radnor Forges, and by the Grantham Iron Works, at Drummondville. The figures of the Canada Iron Furnace Company were:—

Pig Iron made	4,677 $\frac{1880}{2240}$	tons.
Ore charged	13,019	"
Charcoal used	660,000	bushels.
Limestone	1,550	tons.

The returns from the MacDougall Plant are not available. 2175 tons of magnetite were shipped to the United States from the township of Hull. It is not unlikely that the Bristol Iron Mines, in Pontiac County, will be reopened again this year, and there is a movement in progress to exploit the large deposits of the magnetic sands on the North shore of the St. Lawrence.

Mica.—During the first six months of the year mica mining was actively prosecuted principally in Ottawa County, in the districts of Templeton, Wakefield, Hull and Buckingham and record prices ruled for all sizes and grades. Towards the end of the year, however, a reaction set in, the market weakened and production fell off considerably.

Hitherto the bulk of Canadian Mica has found a ready market in the United States where it is greatly favored for electric insulation, and while this is the most natural outlet for our production, there seems to be no reason why a very much larger trade should not be built up with the United Kingdom and the continent where, hitherto, Indian Ruby Mica, from Madras and Bengal, have practically had a monopoly of these markets.

A glance at the statistics given in the following table, courteously furnished by Mr. Harrison Watson, Curator of the Canadian Section of the Imperial Institute will be useful in this connection.

	Quantities. Cwts.	Value. £	Quantities. Cwts.	Value. £	Quantities. Cwts.	Value. £
Norway	....	....	....	....	....	....
Germany	184	1.104	541	1.572	60	538
Holland	4	67	58	77	32	302
Belgium	249	2.395	456	666	95	625
French Possnin India	....	....	....	....	....	....
China	....	....	....	....	....	....
United States	3.442	4.745	10,028	7.550	2353	2916
Brazil	40	544	102	397	417	2455
Uruguay	....	....	....	....	43	250
Argentine Repub.	69	245	62	491	....	....
Bombay	14	120	79	602	70	615
Madras	4086	31364	4,750	33,497	16,136	93,773
Bengal	6171	37796	12.301	69,589	17,156	81,130
Burmah	....	....	4	45	....	....
Ceylon	148	1094	132	932	237	1,440
Hong Kong	....	....	....	....	20	25
South Australia	18	115	....	....	....	....
Victoria	12	95	....	....	....	....
Canada	103	790	200	845	962	4,199
Newfoundland	....	....	71	220	....	....

The late Dr. George Dawson having sent over to London average samples of Canadian Mica with the object of determining their commercial quality and the likelihood of an extension of trade in the United Kingdom, Prof. Wyndham Dunstan, M.A., F.R.S., Director of the Scientific and Technical Department of the Imperial Institute reports as follows:—

"General physical and chemical examination showed that the samples were uniform in character, pliable and softer than much of the mica which appears in the English market.

In order to ascertain its commercial value, and especially its fitness for electrical purposes, the samples were submitted to one of the largest electrical manufacturers in London, and also to one of the largest mica brokers in the City.

The electrical manufacturers report that the mica is suitable for a variety of electrical purposes. On the general question of the uses and comparative value of the Canadian Amber Mica, the brokers remark that this variety of mica is of no other value than for electrical purposes, its special value being principally due to its softness and easy lamination. They are of opinion that Canadian amber mica is of greater value for electrical work than most of the Indian mica that comes to this country. They remark, however, that there are two or three varieties of Indian Mica, such as White Bengal, Cochin, from the west coast of Madras and Ceylon Amber Mica which compare very favourably with the Canadian product, whilst the selling prices of these Indian varieties are often from one third to one half those asked for the Canadian Mica. They confirm the opinions expressed in Dr. Dawson's letters of February 16th and April 4th of this year, that Canadian miners obtain a better price in the United States than in the London market chiefly from the circumstance that American electricians prefer the Canadian product which is close at hand and can be depended upon for uniformity of quality and regularity of supply.

Although circumstances point to the United States as being the natural outlet for Canadian mica, nevertheless it would be worth while to take steps to make it better known in the British market since there are several factors operating against the Indian product, especially in the matters of tariff and regularity of supply."

It may also be of interest to those of our members who are engaged in this industry to learn that during the year ended 30th March, 1900, 22,599 cwt. of mica was exported from India, of which the United Kingdom took 18,569 cwt.; France 33 cwt.; Germany 250 cwt.; United States 3,666 cwt.; Ceylon 30 cwt.; and Japan 51 cwt.

Returns for the United States are not yet available for last year, but we may quote those published by the Director of the Division of Mineral Statistics at Washington for the year 1899 in the hope that they may be useful for reference:—

1899.	Quantity.	Value.
Unmanufactured	1,709,839	233,446
Cut or trimmed	67,293	42,538
Total	1,777,132	275,984

Chromite.—Returns from the Quebec Central Railway show that the shipments of this mineral were: From Black Lake 4,117,840 lbs. and from Coleraine 555,860 lbs. or a total of 2,336 $\frac{1700}{2000}$ tons. The output for the previous year, as reported by the Geological Survey was 1,980 tons of a value $23,760.

It is worthy of remark that a portion of the output was shipped to the Electrical Reduction Works at Buckingham, Que. for the manufacture of ferro-chrome.

COPPER PYRITES.—Production, as in former years, was confined to the old established and extensively worked mines of the Eustis Mining Company at Eustis, and the Nichols Chemical Company at Capelton. Some prospecting was also done in the neighborhood of Sherbrooke.

GOLD MINING.—Attention has been again directed towards the exploitation of the Beauce Gold Fields and some exploration work is being carried on by the Beauce Syndicate Limited, an English Company, over the property of the McArthur estate.

LEAD.—During the year, the old Wright mine, at Lake Temiscamingue, was acquired by the Anglo-Canadian Lead Syndicate Limited, an English Company, having an authorized capital of £21,500, of which £13,437 10s. is paid up. The mine has been reopened and is being re-equipped with new machinery, including a concentrating plant brought out from South Wales. Several hundred tons of ore and concentrates were shipped to England during the year, one cargo assaying :—

Bullion Lead in concentrates..... 63.5 per cent.
Silver per ton of cencentrates..... 14.87 ounces.

OTHER MINERALS.—Barytes, ochre and structural materials constituted other features of the mineral production in this Province. It is greatly to be regretted that a highly successful year should be marred by the inevitable and long looked for collapse of the so-called Gaspé Oil Fields, and the consequent liquidation of the Canada Petroleum Company. While it is possible an effort will be made to reconstruct and consolidate the various companies which have spent with a lavish hand so much British Capital in the exploration of this territory, the outlook does not warrant any expectation of success.

VALUE OF TOTAL OUTPUT.—From these facts I should say that the value of the mineral production of the Province of Quebec will not be less than $3,000,000, as compared with a valuation of $2,000,000 in the previous year.

NEW BRUNSWICK.

The production of Manganese and Gypsum constituted the most important features of the somewhat limited mining enterprise in this Province.

The Mineral Products Company, at Hillsboro, we believe, are now figuring on the construction of a ferro-manganese plant in the Province.

Coal Mining, in Albert and Queen's County, it is reported, will be exploited on an important scale during the ensuing year.

NOVA SCOTIA.

Entering, as they unquestionably are, upon an era of great activity, the coal, iron, and steel industries of Nova Scotia occupy a foremost position in the mineral expansion of the year.

The returns published by the Government are made up for the fiscal year which ends on the 30th September.

COAL.—The output of coal during this period was the largest in the history of this industry, amounting to 3,238,245 tons as compared with 2,642,333 tons in the previous year, and the sales 2,997,546 tons compared with 2,419,137 tons in 1899. The most notable shipments were 624,273 tons to the United States, the greatest on record to this market, the largest previous shipments being 465,194 tons to 1865.

New collieries were opened out and are being equipped at Port Morien, by the Gowrie and Block House Collieries, Ltd., at Port Hood, by the Port Hood Coal Co., and, at Broad Cove, by the Inverness and Richmond Collieries and Railway Co., Ltd. In addition to these important additions to the list of producers, the Dominion Coal Company has three new collieries under development which will materially add to their output during 1901.

A feature of the year was the passing away of the historic General Mining Association, Limited, the pioneer of mineral development in Nova Scotia, which sold the remainder of its once vast mineral holdings to the Nova Scotia Steel Company. The new owners are building an up-to-date coking plant at Old Sydney Mines to supply their furnace plant at Ferrona, in Pictou County, and as a feature of their contemplated large steel works.

The following table shows the output and sales by companies during the fiscal year :—

COMPANIES.	Output.	Sales.	Colliery Consumption & Workingmen.
	TONS.	TONS.	TONS.
Acadia Coal Co	294,884	258,378	37,581
Canada Coals and Ry. Co.	67,290	55,456	8,621
Cape Breton Coal Co.	12,426	9,891	2,535
Cumberland Ry. & Coal Co	428,904	403,170	25,723
Dominion Coal Co	1,930,425	1,808,694	88,041
Gowrie & Blockhouse	Being	opened.	.....
Intercolonial Coal	244,000	226,535	17,484
Inverness & Richmond	56	Being	opened.
Jubilee Colliery	85	58	27
Mabou Colliery	195	65	.....
Nova Scotia Steel Co.	249,910	225,932	28,033
Port Hood Coal Co.	2,323	1,770	522
Scotia Colliery	525	417	58
Sydney Coal Co	7.222	7,180	457
Total	3,238,245	2,997,546	209,082

IRON AND STEEL.—The vast undertakings of the Dominion Iron and Steel Company are well known to all of you. The furnaces and coking plant have practically been completed, and the steel works are rapidly being constructed. The operation of this great establishment means a greatly extended consumption of coal during the present year, and we trust for many years to come. During 1900 the Company imported from their mine at Bell Island, Newfoundland, about 100,000 tons of hematite.

The Nova Scotia Steel Company mined about 1,600 tons from their Bridgeville areas. The operations of this progressive company will be readily understood from the following figures :—

Nova Scotia Ore used at Ferrona	19,000 tons
Wabana hematite (Newfoundland)	33,000 ,,
Other foreign ore consumed	2,000 ,,
Limestone quarried	27,500 ,,
Coke made	29,000 ,,
Pig iron made	29,260 ,,
Steel made	22,000 ,,

Considerable activity was also manifested in the prospecting and exploration of iron areas at Torbrook, in Annapolis County, at Arisaig, in Antigonish County, and at Whycocomagh, in Inverness County, which it is hoped may ultimately lead to the discovery of workable deposits.

GOLD MINING.—The output of gold was slightly in advance of previous years, the returns for the fiscal year (ended 30th September), showing a yield of 31,110 ounces compared with 27,772 ounces in 1899.

The crushings amounted to 65,000 tons so that the average yield was about half an ounce to the ton. The Brookfield Mining Company, Blue Nose Gold Mining Co., and Richardson Gold Mining Co., were, as usual, the most profitably worked undertakings.

At Harrigan Cove 1813 tons yielded 3,403 ounces.

COPPER.—A copper reduction plant was completed at Pictou by the Copper Crown Mining Company, and several hundred tons mined at their properties in Colchester and Cumberland. Deposits at Polson's Lake and Lochaber, in Antigonish Country, were also prospected.

GYPSUM.—Gypsum returns so far show that the year's production was slightly behind last season's, due largely to the non-working of the quarries in the Baddeck Disrrict. It is expected that these quarries will resume work next year, and that the production will rise from 122,281 tons to its normal figure of about 150,000 tons. In addition to the shipments of this mineral, considerable quantities are manu-

factured for local use, ground for house work, and used in the manufacture of fertilizers.

OTHER MINERALS.—783 tons of Barytes were produced from Cap Rouge, Inverness County.

TRIPOLI AND SILICA.—Incomplete returns show that about 1,150 tons were treated, chiefly by the St. Ann's and by the Bass River Silica Companies.

In addition to the usual quantities used locally, the Nova Scotia Steel Co. quarried 24,300 tons of limestone, and the Dominion Iron and Steel Company used a large quantity for concrete work taken from their Georges River Quarry, probably about 75,000 tons. In addition large quantities are being quarried at that place and at Marble Mountain, West Bay, for the company's furnaces.

BOUNTIES PAID IN 1900.

The Auditor-General's Report for the year ended 30th June last shows the following bounties paid on pig iron, puddled bars, steel ingots, and silver :—

Bounty on Pig Iron.

CANADA IRON FURNACE CO. ($18,234.92).—	
Production during 12 months ended June 30th, 1900—	
6052.78 tons from Canada ore @ $3.00	$18,158.34
38.29 tons from foreign ore @ $2	76.58
DESERONTO IRON CO. ($27,026).—	
Production during 12 months ended April 30th, 1900—	
462 tons from Canada ore @ $3	1,386.00
12,820 tons from foreign ore @ $2	25,640.00
HAMILTON BLAST CO., LTD. ($107,009,69).—	
Production during 12 months ended May 31st, 1900—	
11,929.19 tons from Canada ore @ $3	35,787.57
35,611.06 tons from foreign ore @ $2	71,222.12
JOHN MCDOUGALL & CO. ($5,485.07).—	
(Grantham Iron Works).	
Production during 10 months ended April 30th, 1900—	
1,828.37 tons from Canada ore @ $3	5,485.07
NOVA SCOTIA STEEL CO. ($73,162.22).—	
Production during 12 months ended May 31st, 1900—	
11,886,225 tons from Canada ore @ $3	35,658.67
18,751.77 tons from foreign ore @ $1	37,503.55
MINERAL PRODUCTS CO., PICTOU ($7,378.24).—	
Production during 5 months ended Nov. 30th, 1900—	
2,459,415 tons from Canada ore @ $3	7,378.24
	$238,296.14

Bounty on Puddled Iron Bars.

ONTARIO ROLLING MILLS CO.—	
Production during June, 1899, from pig iron made in Canada—	
400,165 tons @ $3	1,200.50
HAMILTON STEEL & IRON CO., LTD.—	
Production during 11 months ended May 31st, 1900, from pig iron made in Canada—	
2,973.54 tons @ $3	8,920.60
	$10,121.10

Bounty on Steel Ingots.

NOVA SCOTIA STEEL CO.—	
Production during 12 months ended May 31st, 1900, from pig iron not less than 50 per cent. of which was made in Canada—	
21,453.43 tons @ $3	64,360.29

Bounty on Silver.

HALL MINES CO. ($17,482.07).—	
Mined in 1898-9, 31,190 tons (proportion of $30,000, less $71.91, cost of inspection)	10,442.09
Portion of unexpended bounty of 1895-6 distributed under O.C.	6,699.95
Short paid on output of years 1895 to 1898, inclusive, as shown by inspection	340.03
BRITISH COLUMBIA SMELTING & REFINING CO.—	
Portion of unexpended bounty of 1895-6 distributed under O. C., $648.81, less overpaid on output of years 1895 to 1898, $193.40 and cost of inspection $49.19	6,246.22
CANADIAN SMELTING WORKS—	
Mined in 1898-9, 57,805 tons (proportion of $30,000 less cost of inspection, $29.35	$19,456.65

TRADE IN MINING MACHINERY.

Coincident with this great expansion in mineral development there has naturally been a correspondingly heavy trade in supplying our mines, mills, and smelters with mining machinery and supplies, a business in which it is gratifying to observe our Canadian manufacturers have more than held their own. The manufacture of many lines of high-class mining machinery has grown rapidly during the last few years, and today we have throughout the Dominion a number of large establishments which in point of engineering skill, equipment, and capacity to turn out good work, will compare favourably with the large works of our enterprising neighbours across the line. Naturally, we are not yet able to fill all the varied requirements of our mines and smelters, and a very large trade is done with the United States and other countries. as a reference to the following official statistics of the imports during the year ended 30th June last, will show :—During this period there were imported under the free list, mining and smelting machinery of a value of $724,187, compared with $299,800 imported in 1899, $207,737 imported in 1898, and $128,780 brought in 1897. Of the free entries the United States supplied $680,250, compared with $283,481 in 1898; Great Britain $43,720 as compared with $16,380 in 1899. The distribution of this machinery was as follows :—

	1900.	1899.
Nova Scotia	$320,038	$ 24,243
British Columbia	182,087	88,911
Ontario	145,040	142,216
Quebec	30,661	26,621
New Brunswick	10,246	212
Manitoba	1,600	1,080
N W. Territory	674	10,926
Yukon	33,841	5,591
	$724,187	$299800

These figures, however, convey but an approximate idea of the great importance of our mining industry in its relation to the trade and commerce of the country, for we find scattered throughout the Trade and Navigation Returns, numerous entries not included in my comparative statement. Here are a few culled at random :—

Diamond Drills (not including motive power, which is dutiable):

	1900.	1899.
For Province of Ontario	$17,940	.....
,, Nova Scotia	2,111	.....
,, British Columbia	4,201	.....
	$24,252	$9,692

(Great Britain $1,030 ; United States $23,222.)

Stamp Mills, Ore and Rock Crushers, Cornish and Belted Rolls, Rock Drills, Air Compressors, Cranes, Derricks, and Percussion Coal Cutters :—

	1900.	1899.
Ontario	$20,683	.....
Quebec	1,548	.....
Nova Scotia	6,738	.....
Manitoba	4,123	.....
British Columbia	2,653	.....
Total	$35,745	$33,780

(Great Britain $365 ; United States $35,380.)

Wire Rope :—

	1900.	1899.
Ontario	$8,773	.....
Quebec	13,364	.....
Nova Scotia	16,271	.....
New Brunswick	3,230	.....
Manitoba	500	.....
British Columbia	33,367	.....
N. W. Territories	814	.....
Yukon	2,582	.....
Total	$78,901	$416,158

(From Great Britain $32,852 ; United States $46,037.)

These notes, hurriedly compiled, are presented in the hope that they may, perhaps, be of some service to the members.

B. T. A. BELL, *Secretary.*

Notes on the Iron Ore Deposits of Bilbao, Northern Spain.

By Frank D. Adams, M.Sc., Ph. D., F.G.S.

The Iberian peninsula, while producing comparatively little iron, is known to contain many large deposits of iron ore some of which have been worked from very early times. Iron ore occurs throughout the whole length of the Cantabrian Mountains on the northern coast of Spain, in Navarre, through the Basque Provinces, Santander and Asturias to North Portugal. Other large deposits are known in eastern and southern Spain, in the Provinces of Murcia, Almeria, Seville and Malaga. It has however, owing to difficulties of transport, been up to the present time worked only near the coast, but many great ore bodies which exist inland—in Leon, Old Castile, Aragon, Andalusia and Murcia—are now being opened up. †

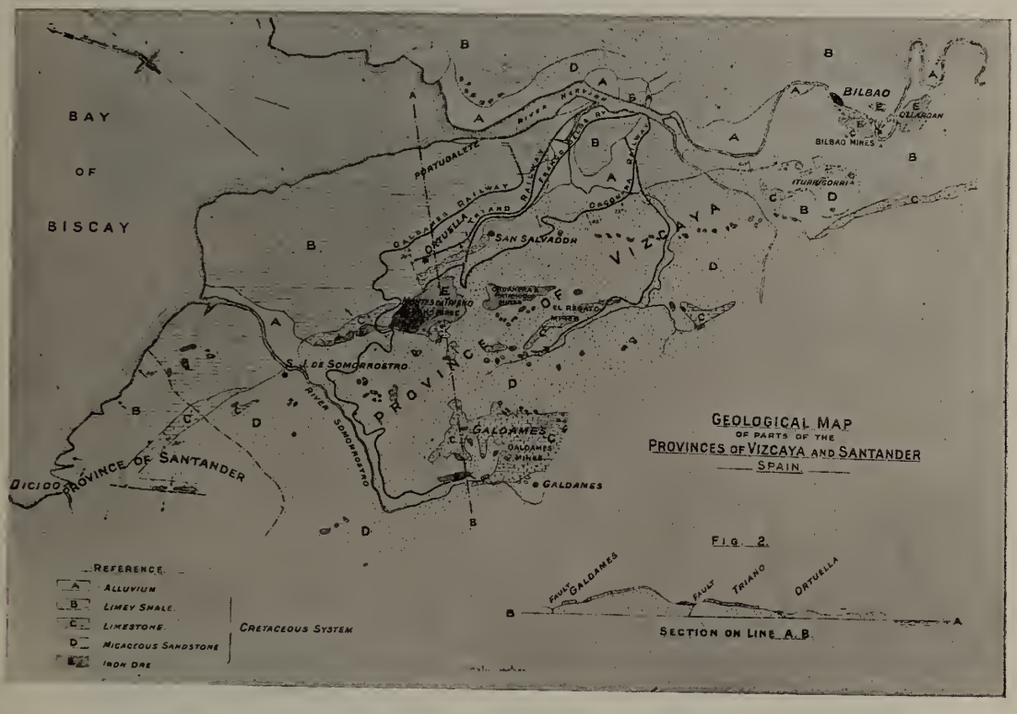
The most important deposits, or at least those which up to the present time have been worked far more extensively than any others, are those which are situated in the district of Vizcaya, in the Basque Provinces, and which, lying near Bilbao from which point the output is shipped, are known as the Bilbao Iron Deposits. These deposits are situated on the northern slope of the Cantabrian Mountains. The ground is for the most part hilly or mountainous, with very little flat land even along the sea shore. The ore lies chiefly at altitudes of between 600 and 1,100 feet. The most important of these Bilbao Iron Ores are those of Somorrostro and Orcanera, the former of which has been worked continuously for several hundred years, and it is believed that it is these deposits which are referred to by the Elder Pliny in the first century of our era when, in his Natural History, he says: "In the part of the Cantabrian coast which is washed by the ocean, there rises a high and steep mountain, which marvellous to relate is composed entirely of iron."

It was from these ores that the metal for the celebrated Toledo blades was obtained, and in fact in the time of Shakespeare these deposits were so renowned that the term *Bilbo* was employed to designate various objects of iron and steel, as sword blades, fetters, etc., and so we find Falstaff (in the *Merry Wives of Windsor*) speaking of himself as "compassed like a good bilbo in the circumference of a peck," and in *Hamlet* a situation described as "worse than the mutines in the bilboes."

These Bilbao deposits however were first worked on a very large scale when the great demand for ores of this particular class was created by the introduction of the Bessemer process, and there are now (1899) in the Bilbao District, no less than 204 iron mines. The following figures will show the rapid increase in the production of iron ore in the District of Vizcaya:—

1861	54,000 tons.
1870	268,500 "
1880	2,345,000 "
1890	4,272,918 "
1899	6,146,542 "

Almost the entire amount in 1899 was exported, only 621,165 tons, or 6.7 p.c. of the total amount mined, being smelted in Spain. The ore is shipped chiefly to England, although a considerable amount is sent also to Germany. In 1899 the shipments to Great Britain, Germany and the United States of America were as follows:—



Great Britain	3,955,000 tons.
Germany	550,000 "
United States of America	75,000 "

The small shipments to the United States are due to great fluctuations in freight rates between Spain and North America. It is important to note that 87½ p.c. of the iron ore imported into Great Britain comes from Spain and chiefly from these Bilbao deposits.

Bilbao, which is the chief port of north-eastern Spain, is situated on the River Nervion, 6 miles from the sea; the name Bilbao being derived from the Basque word *Bulibao*, which means "Town on the Plain." In addition to being an excellent port it has abundant railway communication with the surrounding country. The river all the way down from Bilbao to the sea presents a busy scene, being filled with ships flying the flags of all nations, loading iron ore and other products at the almost continuous succession of wharves and landing stages which occupy the bank of the river. The bulk of the Bilbao ore as shown in the accompanying map is in the Somorrostro District, about Triano and Orcanera, some 6 or 7 miles west of the city of Bilbao on a high ridge immediately south of the railway. It is reached by taking the train to Ortuella from which place good roads lead to the mines. Great ore dumps are seen by the side of the railway all

† Zeit. fur. Prak. Geol., Nov., 1900.

PLATE I.

ESPERANZA MINE.

Shows general character of the surface of the district and open cut from which Campanil is obtained.

PLATE II.

Workings near the Esperanza Mine.
Afford Campanil.

PLATE III.

"CHIRTA"

Residual mantle of ferruginous clay with nodules of limonite scattered through it. The underlying limestone is seen protruding through the "Chirta," in the background. The method of working the deposit and preparing the limonite for shipment is also shown.

PLATE IV.

"CHIRTA."

Showing the peculiar pinnacled surface of the underlying limestone. The material is being shovelled into ox carts, in order that it may be taken to the mill to be washed.

along the base of the Somorrostro ridge, the ore being carried down from the mines by all sorts of conveyances, from the picturesque but slow moving Basque cart drawn by a pair of oxen, (See Plate 6), to great systems of overhead wire rope tramways of modern construction.

The most extensive occurrence (Triano, Ventura, etc.) is irregular in shape, about two miles long and at Mt. Triano five-eighths of a mile wide, with a maximum thickness according to Kendall § of 220 feet.

The country rock is Upper Cretaceous in age and has the form of a saddle, corresponding in direction with the shore, and the ore deposits are found on both sides of this. The Cretaceous shows the following succession :—

1. Light grey shale, very calcareous.
2. Grey limestone, (about 250 feet thick).
3. Dark micaceous sandstone, calcareous.

The strata where the bulk of the iron deposits occur have a general northeast dip which shows however many variations and disturbances. Their present attitude is the result of the upheaval of the Cantabrian Mountains in Tertiary times.

The ore occurs exclusively in connection with the limestone and is thus limited in depth at any point by the lower surface of that rock. This is very important, showing, as it does, that the deposits are essentially superficial in character and extent. The erroneous notion that in the case of the Bilbao deposits we have to do with "mountains of ore," arises mainly from the fact that the slopes of the hills coincide in some places with the dip of the limestone, and this rock having been replaced by ore, the whole hill or mountain seems to the casual observer to be a mass of iron ore, while, as a matter of fact, the ore is present merely as a superficial crust or coating.

The various ore bodies have an irregular elongated form, their longer axes coinciding with one another and with the strike of the strata. The relations of the sandstone, limestone and shale to one another and to the iron ore are well seen in accompanying sections. In one of the Triano sections (Figure 1) the overlying covering of shale is still preserved at the northern end. The other Triano section (Figure 2) shows the limestone entirely removed and replaced by ore in the flat portion of the area about the Concha and Adela Mines, the ore resting directly upon the underlying sandstones. In almost every part of the area the ore appears with a denuded surface, and is either actually exposed to view or concealed by a thin superficial covering. Where the limestone has been completely removed it lies directly on the surface of the sandstone. The ore deposits being thus essentially superficial in character, there are no *mines*, properly speaking, in the Bilbao District.

The ores are of five classes, and are designated locally as follows :—

1. *Vena.*—Red Hematite; compact, soft or sometimes powdery. Generally the purest of the ores, holding about 64 p.c. of iron. It was the only ore used in former times to supply the Catalan forges. Very little of it now remains.
2. *Campanil.*—Red Hematite; compact and crystalline, with numerous little drusy cavities lined with calcite. Said to derive its name from the ringing or bell-like sound which it gives out when struck with a hammer. It is the best of the ores, with the exception of *Vena*, and is one of the chief ores in the Triano Mines. It strongly resembles the hematites of Whitehaven and Furness. It may be said to carry about 55 to 58 p.c. of iron with 4 to 8 p.c. of lime.
3. *Rubio.*—Limonite, carrying about 55 p.c. of iron, but usually more or less siliceous.
4. *Chirta.*—A ferruginous clay, with limonite nodules scattered thickly through it.
5. *Carbonato.*—Siderite, carrying about 44 p.c. of iron. Found almost exclusively at or near the base of the hematite or limonite deposits, and can be seen to pass into them. It was undoubtedly the primary ore and has by its alteration given rise to the *Vena*, *Campanil* and *Rubio*.

These ores are all very low in phosphorus. The Carbonato often contains a small amount of sulphur, but as it is roasted before exportation, this impurity is for the most part driven off.

The following are analyses of samples of the several varieties :—

	Vena.	Campanil or conera.	Rubio.	Carbonato
Ferric oxide	90 70	84.00	79.96	5.31
Ferrous oxide	...	....	....	50.18
Manganous oxide	1.30	1.90	.70	1.00
Alumina	.15	....	1.44	
Lime	1.00	4.60	1.00	.87
Magnesia	.02	....	.55	3.21
Silica	1.05	3.20	8.10	3.60
Carbonic acid				
Sulphuric acid	....	....	.10	....
Sulphur	.03	....	....	trace
Phosphoric acid	....	trace	.03	
Water and carbonic acid	5.40	6.00	....	36.28
Water	....	....	8.25	
	99.65	99.70	100.13	100.45
Metallic iron	63.49	58.80	54.62	43.96

The workings are practically all open cuts with a few short tunnels. The accompanying photographs* show some of the principal occurrences in the Triano District. The first of these (Plate 1) shows the Esperanza "mine." An open cut in Campanil mixed with streaks of yellow ferruginous clay and limonite. The ore contains the little drusy cavities lined with calcite, mentioned in describing the ore, in great abundance, one or more being present in every hand specimen.

Another similar occurrence of Campanil, worked by a great open cut and tunnels, near the Esperanza, is shown in Plate 2.

The next workings which were visited presented a deposit of a different character, the so-called Chirta. It is a yellow ferruginous clay with nodules of limestone scattered abundantly through it. It lay upon the limestone, mantling it deeply, the bed rock however protruding in places, as seen in the background of the picture. The face of the clay bank was being torn down by workmen with picks, the material being then thoroughly disintegrated by means of implements resembling forked mattocks, and then screened. The several processes are shown in the photograph (Plate 3). In this way the limonite nodules are separated from the clay and the ore prepared for shipment.

In other workings near by, the limonite-bearing clay was mixed with water and passed through an inclined revolving cylinder, the inner surface of which was studded with spikes. As the material passed out of the lower end of the cylinder and down a gently inclined shallow trough, any large unbroken clay masses were picked out by a number of men and boys, and were thrown aside to be crushed and once more passed through the cylinder. The finer washed stuff consisted of the limonite nodules and the water carried away the clay. A rather clumsy process, entailing much labour, the wages of a man, however, being only two pesedas a day.

§ The Iron Ores of Spain. Trans. of the Fed. Inst. Mining Eng Vol. III, 1891-92, p 607.

* For those photographs I am indebted to Professor Rils of Cornell University, in whose company I had the pleasure last summer of visiting the deposits described in the present paper.

PLATE V.

SAN BENITO PROPERTY.
Yields Rubio and Carbonato.

PLATE VI.

SCENE ON ROAD BETWEEN ORTUELLA AND TRIANO.
Basque ox cart employed to carry ore.

The origin of this Chirta is well seen in some or the neighbouring occurrences. (Plate 4). The underlying limestone where it is exposed on the higher ground or where it is laid bare by the removal of the Chirta by the pick of the workmen, is seen to have been dissolved away giving rise to that peculiar surface form, seen often in the bare limestone districts of the Upper Alps and known as Karren structure. The edges of the limestone beds stand up like sharply pointed slabs, a form evidently produced by the solvent action of the rain or percolating waters upon the surface of the limestone, while the Chirta which represents the insoluble residue, which has gradually accumulated from the solution of a very considerable body of limestone, remains as a mantle upon the surface of solution and in pockets between the Karren. Much of the iron oxide has gathered itself together by concretionary processes into the limonite nodules which constitute the ore.

In another immense open cut or quarry, worked in benches and known as the San Benito property, the Rubio and Carbonato were seen. A photograph of this is shown in Plate 5. The Carbonato or Siderite has a banded appearance and seems, in places at least, to be interbedded with limestone. It is seen only in the lower levels of the cut, being covered by the porous limonite known as Rubio, which is the superficial alteration product of the Carbonato and can be seen to pass into it, working downward along joint planes and fissures in the siderite and often enclosing blocks of the latter not yet entirely altered. At the time of our visit, the white Carbonato and dark Rubio were being worked together along a face in the cutting where they occurred intimately associated, one passing into the other.

The Carbonato is calcined before being shipped, in furnaces situated on the lower slopes of the cut.

The origin of the ores seems to be as follows:—

The limestones themselves and especially the overlying calcareous shales contained, as these rocks so frequently do, a certain amount of iron disseminated through them in the form of various ferruginous compounds. The country during later Tertiary and Quaternary times was subjected to long continued denudation. The calcareous strata under these circumstances were dissolved and the iron passing downward in solution was, in the lower portion of the limestones, converted into carbonate of iron, which may therefore be considered as the primary ore, being the first ore concentrated in bodies of considerable size.

As the denudation proceeded, the calcareous shales and the lime stones, being thoroughly leached out, left their insoluble residues as a mantle of residual clay, and under the oxydizing influence of the air and oxygenated waters, much of the iron instead of being removed by the waters was left behind in the form of insoluble oxides,—Limonite or Hematite, "Chirta" or "Campanil"—mixed with ferruginous clays. As the surface of the country became lowered, the deeper bodies of Carbonato also became oxidized to Rubio—and hence the deposits in their present form. The concentration is undoubtedly going forward at the present time.

Farther to the east along the same line of folding, in the Pyrenees, as for instance at the well known Rancie Mines near Vicdessos, there are also iron ore deposits in the form of bedded veins of limonite, occurring in limestone and passing over in depth into siderite. The strata however here being highly tilted, the deposits follow the limestones down to great depths and are not confined to the surface as in the case of the Bilbao ores.

The Bilbao ores in their relations and mode of occurrence bear a strong resemblance to the limonite deposits of the great limestone valleys of central and eastern Pennsylvania, which have been worked for the production of iron ever since the rise of this industry in America. These have been made the subject of a recent paper by Mr. T. C. Hopkins,† who shows that they occur chiefly in the residual clays formed by the solution or disintegration of the Ordovician and Cambrian limestones and slates underlying these portions of Pennsylvania, the original source of the iron being the strata by whose decay the clays in question were formed, and through which strata it was originally disseminated chiefly in the form of carbonate.

It is stated that the Bilbao ores are steadily degenerating in quality,‡ and also that the deposits are rapidly approaching exhaustion. Lying altogether in the limestones and being thus essentially superficial deposits, exposed and worked over the whole surface simultaneously, it would seem that they have seen their best days.

"We are continually hearing that the deposits are almost exhausted," said a Spanish ore shipper, "but year by year we have a larger output." This very fact, however, is hastening on the end. But while these deposits may be and probably are approaching exhaustion, many new deposits, as has been mentioned, are being opened up farther inland, so that the supply of Spanish ore will probably continue without serious diminution for at least some years to come.

† Cambro-Silurian Limonite Ores of Pennsylvania. Bull. of the Geol. Soc. of America, vol. 11, 1900.

‡ See Paper by Kayser, in Stahl and Eisen, vol. xviii, p. 373.

Concentration of Argentiferous Galena as carried on at Helena Frisco Consolidated Company's Mills, Gem, Idaho, U.S.A.

By W. Muir Edwards, Montreal.

The subject of my paper this afternoon is the Concentration of Argentiferous Galena as carried on at the Helena Frisco Consolidated Company's Mills, in which I worked as vanner man about four months last summer. The mine, the treatment of whose ore this paper deals with, is situated in the Coeur d'Alene district—a district justly celebrated for its lead and silver mining. The country is very mountainous and although at first the prospects were opened up and worked by shafts sunk on the outcrop, now most of the mines are worked by a tunnel driven into the hill to cut the vein, and a vertical shaft sunk on the vein. The Helena Frisco mine is worked by a tunnel about ¼ mile long, driven in to cut the vein at the 600 ft. level, and a vertical shaft sunk at this point, which last summer had reached the 2,200 ft. level. Levels are driven every 200 ft., and the mine is operated by a system of over-hand stoping. The stopes are permanently timbered, and everything taken out of them is put through the mill.

Material Treated.

The material to be treated consists of an Agentiferous Galena, a considerable amount of zinc sulphide and a dark colored country rock with a hardness of about 4½ and a specific gravity much less than that of either the lead or zinc sulphides, in fact the difference in the specific gravity of the lead and zinc is so small as compared with that of the Galena and the country rock that the latter is never seen at the point of concentration, the separation being entirely between the lead and zinc sulphides.

The Galena is of two varieties, one a very fine grained, and the other a coarse grained having a good cubical cleavage.

The silver is carried largely by the cryptocrystaline variety, and its percentage varies slightly in different parts of the mine. It is usually quoted in the mill-concentrates as running 22 oz. to the ton.

The zinc occurs both in the powdery form distributed through the Galena, and also in the massive form. The presence of zinc how-

ever, in large quantities is not universal throughout the Coeur d'Alene district. Some mines, the Hecla for instance, have no zinc at all, while others have not as high a percentage as the Frisco which with the Tiger Poorman are about the worst in this respect. The process of separation is, of course, much simpler where there is no zinc sulphide in the material. The large specimen on the table marked A gives a very good idea of the material to be treated in the Frisco. In it can be seen the waste rock, both varieties of the Galena, and also, the powdery form of the zinc; the massive zinc also showing.

General Description of Mill.

The plant for separating these different constituents is contained in a 750 ton mill situated at the mouth of the mine tunnel. It is a five storey structure built up the side of the mountain, narrow at the top where the crushers are placed and broadening out for the jig and vanner rooms below. On the fifth floor are the crushers. Between the fifth and fourth floors, but in an extension by themselves, are the Pelton water wheels, four in number, which drive the coarse mill, the fine mill, the slime mill and the dynamo which supplies light to the mill and mine. Each of these is separated and may be speeded up, slowed down or shut off independently. On the fourth floor are all the rolls which are used in the mill—the dry rolls set immediately in front of the bin into which the crusher feeds; the Allis rolls which receive the middlings from the coarse jigs, and three fine rolls which crush the middlings from the fine jigs. On the third floor are the arrangements for classifying the feed for the different concentrating machines below. These consist of a separation by two sets of trommels, followed by an hydraulic classification as the feed passes down a launder over the jigs, followed by a settling out of the coarser slimes as the overflow from the jig launder flows through a tank above the tables, and a final settling out of the finer slimes as the round tables' overflow passes down a long tank behind the vanners. The second floor is the concentrating floor on which are the jigs, round tables and vanners. On the first or ground floor are the ore-bins, slime concentrate bins, apparatus for weighing and loading the ore, settling tank for mill overflow and also a lower vanner room.

Detailed Process.

As the mine and the general arrangement of the mill have been described, we might now consider somewhat in detail the treatment of the ore. The process is as follows—the ore is run out of the tunnel in a string of cars pulled out by a horse. The cars which are then on a landing a storey above the crusher floor are weighed, run over and dumped into a bin having a capacity of about 60 cars, which is behind and above the crushers. From this bin the ore slides over a grizzly down which it is raked by the crusher man to the crusher. The fine material passes through the grizzly and under the crusher, thus saving a needless waste of power. While being raked over the grizzly the feed is also cleaned of the wood, spikes, broken hammers, candle hooks, etc., which necessarily are mixed with it.

The crushing apparatus consists of two Blake crushers, one a 10 x 20 in., and the other a small emergency crusher 10 x 15 in. placed alongside in case the big one should have to be shut down for repairs. The capacity of the larger crusher is such that it can put through more than the jigs can handle. The jaw plates are set from 1 in. to 1¼ in. apart, the size of aperture varying slightly as owing to the fact that everything is put through the mill, the character of the feed varies a good deal. The crushed material falls into a bin from which it is fed by a shaker to the coarse or dry rolls. This feeder is a long shallow box shaken lengthwise by a cam and spring attachment, which is adjustable so that any desired feed may be given to the coarse rolls.

The rolls are 30 in. diameter, and 15 in. across the face. They are set ¾ in. apart and run at the rate of 34 R.P.M. From these rolls the feed slides by gravity to the trommels.

The trommels consist of two sets. The first set comprises two exactly similar trommels 6 ft. long x 3 ft. in diameter, each having two divisions with 10 m.m. and 15 m.m. holes respectively. They are set side by side, the left hand trommel handling the direct feed from the coarse rolls, while the similar trommel alongside handles the recrushed coarse-jig-middling from the Allis rolls.

The second set consists also, of two similar parallel trommels, 8 ft. long by 3 ft. in diameter, having three equal divisions with 3, 5 and 7 m.m. holes respectively. Each of these trommels handles half of the mixed feed passing through the 10 m. m. holes of the first set. All of the trommels are revolved by gear wheels at the rate of 20 R.P.M. and run wet, being watered by a row of spouts running along above them.

The feed is thus divided according to size, with 6 separate portions—the oversize of the 1st set, material between 10 and 15 m. m., the oversize of the 2nd set, material between 3 and 5 m. m., and material finer than 3 m. m. The last two portions pass on to be further classified for the feed of the fine jigs, tables and vanners. The other four portions comprise the feed of the coarse jigs. As it would be tedious to enter into a detailed description of the throw, R.P.M. size of sieve and other particulars in regard to both the coarse and fine jigs, I submit information drawn up in tabular form giving the feed, the R.P M., the number of compartments in which concentrate is made, both Hutch and Top, and similar information of the middlings, the size of sieve used in the different compartments and finally whether tailings are made or not.

All of these jigs, with the exception of the Bull jig, which is a three compartment single jig, are four compartment ones, arranged in sets of twos placed back to back, each set handling one portion of the classified feed. The plunger is worked directly by an eccentric on a shaft run from an overhead pulley. The throw in the different compartments is not given in the tabulated statement because it varies a good deal, the variation depending not only on the feed treated but also on the fit of the plunger. It can only be stated that the Bull jig has an eccentric throw of from 2½ to 2 in., and that the rest of the coarse jigs have a throw varying between 1½ to 1 in. The throw in the fine jigs decreases from ⅞ down to ⅛ in. as the feed gets finer, but there is no uniform decrease, the lack of uniformity being not so noticeable as in the coarse jigs.

The coarse jig room contains the Bull jig and four sets of jigs, the extra set being provided to handle half of the feed from the 15 m.m. holes of the first trommel.

The concentrates from these coarse jigs are led down by pipes to the ore-bin below. The middlings are led down to an unwatering tank on the lower floor and are then raised by a bucket and belt elevator up to the roll floor, where they are put through a pair 36 by 14 in. Allis rolls. They then pass into the left hand trommel of the first set and so start through the mill again. The tailings go direct to the tail race.

This finishes the concentration carried on in the coarse mill as it is called, which comprises the crushers, the dry and Allis rolls, the two sets of trommels, No. 1 elevator and nine jigs. This mill is run by a separate Pelton water wheel and may be shut off independently of the rest of the mill. This is an important consideration especially as regards the slime mill which may be kept running even if the coarse, or fine mill for that matter, has to be shut down to repair the elevator, or on account of choked rolls an event which happens frequently.

We have now to consider the concentration carried on in the fine and slime mills. It will be remembered that the feed smaller than 5 m. m. passes on to be further classified. This is first done by a Calumet classifier running along above the "direct" fine jigs. This classifier

consists of a launder with boxes on the side opening into the main launder and having rising currents of water of varying intensity in them. The heaviest particles naturally settle out in the upper boxes and a separation according to the heaviness of the pieces is thus made. The feed thus classified and the different portions led to suitable fine jigs below the overflow passes on to the round table tank. The particulars of these jigs are given in the tabulated statement and need not be described here. The concentrates from these jigs are led to the ore-bin below. The middlings from these fine jigs are run to an unwatering box on the lower floor in front of No. 2 elevator. The settled material in the box is run into the elevator through a gate at the bottom of the box. The over flow passes to a long tank from the bottom of which the settled material is tapped by spiggots and this is also run into the elevator. The overflow of the tank passes to the main settling tank of the mill. The elevator takes the middlings up to the roll floor, where they are run into an inclined launder behind the pair of fine rolls to which it is fed by gates.

These rolls are Allis wet rolls 30 in. in diameter and 14 in. width of face and run at the rate of 88 R.P.M. The feed is divided equally between the rolls from which it passes into a small trommel. This trommel is 8 ft. long, 36 in. in diameter, has a mesh of 3 m. m., and runs at the rate of 20 R.P.M. The oversize of this trommel passes into a small elevator which raises it to the roll floor again and passes it into the third pair of fine rolls. These are 24 by 14 in. rolls and run at the rate of 52 R.P.M. From these rolls the recrushed product passes again into the middling trommel. The feed passing through the mesh of this trommel is equally divided between two similar Calumet classifiers exactly similar and parallel to that on the direct feed side. In the fine jig room, and also in the vanner room, the recrushed middlings are treated, one, the left hand side, (travelling with the feed) and the direct feed on the right, an equal number of machines being provided for each.

The middling jigs are exactly similar in construction to the direct feed ones, but in practice no tailings are made unless the feed is very heavy, overflow water only being allowed to go into the tail race. This it will be seen throws a very heavy zinc feed on the middling vanners.

The middlings from these jigs are piped down to an unwatering box in front of No. 2 elevator and are elevated and recrushed. The concentrates of course pass to the ore bin below.

Bedding is used on all the fine jigs. It collects gradually itself on the direct feed side and is skimmed off and taken over to the middling jigs with a shovel. This has to be attended to frequently. The size of the bedding is shown in the samples.

The fine jig room contains in all eight sets of jigs, four on the direct feed side and four on the middling feed side. They comprise what is known as the fine mill and are run by a separate Pelton water wheel.

The overflow from the three Calumet Classifiers passes over screens through which it falls into a tank above and behind the round table. This tank is 54 feet long and of a cross section as shown in the diagram submitted. The side of the tank near the bottom is pierced with a number of holes filled with big spigots which again have small holes in them plugged with small plugs about ⅜ inch in diameter. There are about ten of these holes behind each table. Half of these feed three at a time on the top table and the other five feed a similar tank below which in turn feeds the second row of tables There are three tiers of tables, three in each tier, the middlings from the upper two comprising the feed of the lower table. The tables are 18 feet in diameter and have a speed of one revolution in 75 seconds. The concentrates from all three tables go direct to the slime concentrate bin while the tailings go direct to the tail race. The middlings from the lower table run down and into an elevator (No. 4) by which they are elevated to a settling tank behind the middling vanners. Samples of the round table concentrates, middlings and tailings are shown in bottles 22, 23 and 24.

The overflow from the round table tank runs into a long tank behind the direct feed vanners.

The feed, by a system of launders especially on the middlings side is made fairly uniform.

The upper Vanner Room contains ten vanners, five on the direct side and five on the middling side. They are the ordinary 6 ft. Frue vanners and run at from 205 to 210 R.P.M. The feed is from spigots in the bottom of the settling tank, there being five spigots about ¼ inch in diameter opening into a launder snpplying each vanner. Two of these are kept running, the plugs behind the vanners being changed every half hour. This insures a more uniform feed and also places the feed on the vanners much thicker. There are two very good devices which are not met with on all Frue vanners. One consists of a small extra roller held tightly against the out side of the belt just below and behind the large front roller as shown in the diagram. This cleans the belt very thoroughly and causes all the concentrates to fall into the box doing away with the heavy hoeing which is one of the hardest parts of a vannerman's work. The other device consists of a hole in the bottom of the concentrate box connected by a short pipe with a launder running into the slime concentrate bin.

A constant stream of water is fed into the concentrate box and this washes the concentrate into the launder and so carries it to the slime concentrate bin where it settles, thus doing away with all shovelling and transporting of the concentrate. The overflow from the vanner tank passes into a long covered tank outside the mill where the settled material is again drawn off by spigots and this feeds into the settling tank behind the lower vanners. The overflow from this last settling tank outside the mill passes to the tail race. The tailings of the upper vanner which runs about 2 per cent. lead run down to the settling tank behind the lower vanners.

In the lower vanner room there are four 6 feet and one 4 feet Frue Vanners. The feed from the outside overflow tank feeds in at the end and the tailings from the upper vanners feed in a different point along the tank and are therefore principally handled by some separate vanner.

The overflow from the feed tank runs into the tailing launder and helps to flush it out. The lower vanner concentrates are wheeled out by wheel-barrow and dumped in a pile preparatory to loading. The tailings which are expected to be kept 1½ per cent. go direct to the river.

Samples of vanner concentrates which should be between 50 and 60 per cent. lead, and of the direct and middling tailings are shown in bottles 25, 26 and 27.

The slime mill is run by a separate turbine and the speed of the vanners may be varied to suit the feed. Although the tables are also run with this turbine, the speed is altogether regulated to suit the vanners. The speed varies between 200 and 210 R.P.M., the speed depending in the percentage of zinc, a very heavy zinc load necessitating a high speed.

The concentrates from the mill are run into bins and allowed to settle, the overflow water passing into the mill settling tank. There are two ore bins and two slime concentrate bins, the feed being turned into one of each pair while the other is being cleaned out. The ore is wheeled out, weighed, run and dumped into freight cars in which it is transported to the smelter.

The mill is exceptional in not having the fine jig middlings ground

in a Huntington mill. Most of the mills in the canyon have one or more Huntingtons. The need of one was felt however when a heavy feed was put on the mill, as the feed on the round tables was much too coarse causing a large loss in the tailings, the tailings running sometimes as high as 12 to 14 per cent. This also had the effect of throwing a heavy coarse feed on the middling vanners which was hard to handle since the latter had to be run at the same speed as was required to handle the direct feed which would not be appreciably affected. As the middling feed was the richer, however, when the tables get loaded, which they did sometimes to the depth of 2 inches, everything of course being then washed into the middlings, the vanners were speeded up to 220 to 230 and a very fair separation was made under these circumstances. The plans for installing three Huntingtons were in process of completion just before I left Experiments with the Halet table were also to be made, looking to a substitution of these for the round tables. Most of the other mills use Wilfley tables for treating a size between that treated by the round tables and the vanners. Wilfley tables had been used in the Frisco mill but had been discarded in favor of an additional number of vanners.

The motive power is obtained by tapping the creek which runs past the mill about a mile and a half up the canyon and leading the water by a flume to a point above the mill. From the penstock the water is led down by a 6 inch pipe to the Pelton water wheels, the feed pipes being connected although the turbines are separate. The mill may also be connected to an engine driven by steam when the water is too low in the creek. It is usually necessary to use this engine from September to March

The mill comprising a 10 x 20 inch crusher, 5 rolls, 9 coarse jigs, 16 fine jigs, 12 round tables and 15 vanners is designed to handle 750 tons every 24 hours. In practice however, good results are not obtainable with a larger feed than 600 tons. With this amount of feed per 24 hours the mill can separate the valuable material from the waste with only a loss of 3/8 per cent. in the mill tailings. A staff of seven regular mill men, comprising a crusher man, a roll floor man, two jig men, one vanner man and shift boss is employed to operate the mill.

I might just briefly compare the above practice with the German practice in similar ores as carried on at Clusthal in the Hartz for the description of which I am indebted to a report by Mr. C. Van Petersdorff in the Report of the California State Mineralogist for 1890. The chief differences are:—

First.—That in the German practice there is an elaborate preliminary hand-picking which with our high priced and non-interested workmen is not done extensively on this side of the Atlantic. At Clusthal for instance seven separate products were made by hand picking and each of them had a separate treatment. At the Frisco everything was put through the mill except when, as sometimes occurred, they were able to ship crude ore.

Again separation by sizing is carried on on much smaller material at Clusthal than at the Frisco. At the former establishment after an hydraulic separation, getting rid of the slimes, the coarse product was sized down as low as 1 m. m, while everything below 5 m. m. was sorted hydraulicly at the Frisco. There is also a difference in the treatment of the middlings. Those at Clusthal are recrushed by stamps, while at the Frisco, at least I suppose this is true by now, the middlings are recrushed by Huntington mills. The superiority of the American practice in this respect is however being recognized on the other side, I believe, and Scrantz mills, which are very nearly equivalent to Huntingtons are being installed instead of the stamp batteries. Finally in the general arrangement of the mill it is also noticeable that while at the Frisco the machines of the same kind are grouped together on one floor, viz., the rolls on the roll floor, the jigs on the jig floor, etc., the practice at Clusthal is to have the group of machines for any one operation on the same floor, i. e. coarse crusher, screens and jigs on one floor, the fine crusher, screens and jigs on the next floor, etc., this latter arrangement does away with the elevation of the middlings but is very wasteful of "drip."

In conclusion permit me to say, gentlemen, that any opinion I have offered and any statements I have made in the course of this paper are based only on personal observations as a student workman in the mill, and while visiting other mills in the canyon, and on opinions gleaned in conversation with other mill men, therefore if I have made mistakes which are apparent to gentlemen present who have doubtless a more intimate acquaintance with the district or with the particular concentrating propositions presented, I trust you will pardon me.

The Determination of Lead in Ores by Fire Assay.

By W. Lay, A.R.S.M., Kimberley, B.C.

The fire assay, dependent as it is upon many variables, is at best, an approximation only to the ultimate lead contents of the ore, and is strictly speaking applicable only to pure ores of medium or high grade. But since upon it smelting charges are based, and consequently ores bought and sold, in the great generality of cases admittedly inexact as it is, the method has been widely adopted.

In many institutions for the instruction of assaying, it is customary to start the beginner with dry lead assays, the prevalent idea apparently being that it is a somewhat elementary task, whereas all practice tends to point to the fact that the succcessful conduct of that operation requires considerable experience, and that it is in reality one of the most difficult of the fire assays. Moreover, text books on the subject of assaying seem to be singularly reticent regarding the difficulties likely to be encountered, and of the manner in which to cope with them. In view of these facts, the following inquiry into the sources of error in the fire assay, being the outcome of a somewhat wide practical experience with many and varying grades of lead ores, may be of interest.

In the first place errors may arise from:—

1. *Loss* of *lead* owing to
   (a) Volatilization.
   (b) Lead passing into the slag in chemical combination.
   (c) Spirting causing mechanical loss.
2. *The Presence* of *certain elements in the ore*, which under the conditions of the assay are also reducible, and pass into the button of lead simulating that metal.

The first source of error—loss of lead from the three causes mentioned, may be guarded against, and may be reduced to a minimum, by taking due and necessary precautions, but should elements be present to any extent in the ore, which like lead are reducible, the fire determination, upon the face of it, breaks down altogether, and wet analysis must be resorted to. Zinc, copper, tin, antimony and bismuth, are susceptible of reduction in a similar manner to lead, but of these only zinc, copper and antimony are likely to be met with in lead ores, as a rule, and copper and antimony only will be of material effect (unless the amount of zinc present is excessive), and inasmuch as copper will be readily detected prior to assay, antimony will be likely to cause most trouble, and should the resulting lead button show the slightest signs of brittleness upon assay of an ore, a wet determination of the lead contents should be made. The following assays show that antimony when present even in small quantities is not

volatilized to any extent, but passes mainly into the lead button, and to a lesser extent into the slag, since the conditions, which favour accurate estimation of the lead, also promote the more or less complete reduction of the antimony.

The fusions were made in a muffle, in a reducing atmosphere. Charges thus :—

Ore—10 grams,
Flux—30 grams,
Salt cover and 2 iron nails.

Flux composed thus :—
Bicarb. soda—16 parts, Carb. potash—16 parts, Borax—8 parts, Flour—5 parts.

DURATION OF FUSIONS 1¼ HOURS.

Per cent. Antimony in Ore.	Per cent. Lead in Ore wet analysis.	Per cent. Lead in Ore fire assay.	Condition of button resulting from fire assay.
0.63	54.2	53.6	No evidence of brittleness.
0.90	55.7	54.7	Slightly brittle.
1.35	55 3	54.9	Buttons crack under the hammer.
1.80	54.8	54.8	
2.70	50.3	51.0	
3.60	47.7	48.5	

Since then it is impossible to guard against this latter source of orerr, it would seem that attention should centre upon the *loss* of lead from the various causes mentioned, and upon the *conditions* affecting that loss.

First as regards *loss* of *lead* :—

Loss by volatilization.—While lead and its compounds are sensibly volatile at comparatively low temperatures when exposed to the air, yet it must be borne in mind that, in process of assay, the reduced lead, and that still undergoing reduction, are covered with slag and so protected, while the temperature during the greater part of the operation is low, hence it would seem improbable that a material amount of lead would be volatilized provided the proper conditions prevailed.

Loss in the Slag.—Whatever properties the flux used may possess, a certain chemical loss of lead is bound to occur in the slag, since complete reduction, under the most favourable conditions, cannot be effected. The analysis of slags from a number of very carefully conducted assays showed a mean percentage of 0.62 per cent. lead. Further investigation showed that this chemical loss largely increases with the temperature, and that in cases of improper firing, it may amount to almost double this last figure.

The following assays will illustrate the loss in the slags as compared with that by volatilization. The assays were made in precisely the same manner, as regards amount and proportion of the charges of ore and flux, and duration of fusion as those above quoted :—

Per cent. Lead in Ore wet analysis.	Per cent. Lead in Ore fire assay.	Difference between wet and fire assays in units of Lead.	Per cent. Lead in slag wet analysis.	Weight of slag from fire assay (approximate)	Units of Lead accounted for in slag.
50.9	49 2	1.7	0.62	28 grams.	1.7
52.2	50.7	1.5	0.53	28 "	1.5
52.7	51.1	1.6	0.47	29 "	1.4
62.6	61.0	1.6	0.53	28 "	1.5

It would seem from these analysis that the greater part of the missing lead can be accounted for in the slag, taking the difference between the wet and fire determinations as representing the ultimate loss. The loss by volatilization in these instances must therefore of necessity have been not appreciable.

Loss from Spirting.—This mechanical loss of lead caused by too high initial temperature is probably the greatest source of error—a conclusion justified by the evidence afforded both by observation and experiment.

The following are typical of the loss which may be occasioned by this cause :—

Charges of ore and flux same as before :

Per cent. Lead in Ore. Time of fusion 1¼ hours.	Per cent. Lead in Ore. Time of fusion ½ hour.	Per cent. Lead in Slag by wet analysis.
53.6	51.0	Slags average 0.74 per cent. Pb.
54.5	52.9	
51.0	50.1	
49.4	47.1	
61.2	59.3	
53.0	51.0	

Second as regards the *conditions* which affect the loss of lead.

The loss of lead from the various causes considered, may be said to depend essentially upon, and to be governed by the following factors :—

(1). The temperature and duration of the fusion.

(2). The atmosphere, neutral reducing or oxidizing in which the fusion is conducted.

(3). The nature and properties of the flux employed.

Temperature.—The great secret is to *start* the assays at a *low* temperature. For the first 45 or 50 minutes, it should not exceed that of *incipient* fusion of the charge—dull redness (say about 550° C), and should then be gradually raised till at pouring it about equals that of a gold assay. The total time of the operation should be from 1—1½ hours—certainly not less than 1 hour—carbonate ores not requiring so long for their reduction as sulphides.

While a low initial temperature is a *sine qua non* of success, as guarding against loss of lead by spirting and a minor loss by volatilization, yet on the other hand the temperature during the earlier stages must not be too low, otherwise the necessary reactions will not have taken place, and the right conditions will not have been arrived at when the temperature is raised, and the results will be vitiated.

The atmosphere in which the operation is conducted should be reducing. In the case of a muffle furnace, this may be attained by placing a few pieces of charcoal in the front part of the muffle, and a more even temperature throughout the muffle is also thereby engendered. This measure ensures conditions which combat volatilization of lead. Protected by a layer of slag and surrounded by an envelope of reducing gas, loss from this cause is minimized. Arsenic, when present in any considerable quantity would seem to promote this loss.

The Flux.—The essential features of a good lead flux may be stated thus :—

(1). It must be readily fusible to protect the lead from volatilization.

(2). It must contain excess of carbon.

(3). The amount of borax present must not be excessive, otherwise lead will tend to pass into the slag chemically combined as a borate.

(4). It must act as a desulphurizer.

The following well known lead flux composed of :—

Bicarb. soda	16 parts.
Carb. potash	16 "
Borax glass	8 "
Flour	5 "

When used in the proportion of 3 of flux to 1 of ore, with a salt cover and a couple of iron nails in the charge, will be found to give satisfactory results in the case of oxidized and sulphide ore alike.

Upon an average, in the case of ores of medium and high grade, *free from interfering elements*, the wet assay exceeds the dry by about 1.7 per cent., though in some instances the dry assay can undoubtedly be made to more nearly approach the wet.

The writer desires rather to emphasize the fact that the conclusion that in a properly conducted fire assay the main loss of lead is occasioned not by volatilization but by chemical combination in the slag, is outborne by analysis, though he is well aware that it is somewhat at variance with the views of some, who lay great stress upon the volatility of lead, seeming to hold it up as the main source of error.

It may be said in favour of the fire assay that rapid determinations can be made which satisfy many technical requirements, but it must be acknowledged that rapidity in this case is quite incompatible with accuracy. At best the determination is unsatisfactory, inasmuch as while the errors involved may be reduced to a minimum, their total elimination is impossible. It would seem then that these facts argue strongly for the speedy and general adoption of the wet method (with a certain arbitrary deduction) as a basis for settlement in the case of the buying and selling of lead ores, as is the custom with copper ores to-day.

In conclusion, it may be said that the views expressed in the foregoing, have been arrived at by the writer, after making upwards of 10,000 lead determinations in almost every kind and grade of ore, pure and impure, and after he has been checked up by other chemists in the case of upwards of 1,000 samples.

Pioneer Work in The Crows Nest Coal Areas.

By Wm. Blakemore, M.E., Montreal.

At the moment of commencing to write, news comes to hand of the sudden demise of Dr. G. M. Dawson, the respected head of the Geological Survey of Canada, and it is imperative that anyone professing to treat upon the subject of this paper should, under the sad circumstances, pay a tribute to the value of those splendid services, which he so faithfully rendered to the country; and especially is it fitting that I should do this because he was the first authority to recognize the value and possibilities of these coal areas. He passed through the country in 1881, and although there was only time for a cursory examination, his keen perception, and intuitive scientific genius enabled him to prepare a monograoph, the accuracy of which has been fully established by subsequent detailed surveys; and for the geological data upon which this paper is based, I wish to acknowledge my indebtedness to Dr. Dawson's reports, which were of the greatest assistance to me, when first opening up the coal seams for active operation.

But whilst Dr. Dawson may be called a scientific pioneer of the Crows Nest Pass, and the first to realize its enormous importance and value, it is right here to tender a meed of praise to the men who first discovered the existence of coal and, especially, to the one man whose name is most intimately associated with this district. It was in the late seventies that Mr. William Fernie, in company with his brother, whilst prospecting near Martin Creek for gold first noticed coal float in the bed of the streams, and was led by this to make a more careful examination of the steep mountain sides, and finally to discover at an elevation of about 6,000 feet the outcrop of a 30 foot seam of coal. Although this was Mr. Fernie's first experience in dealing with anything but the precious minerals, he was shrewd enough to conclude that it might be a find of considerable importance, and from that date until 1896, when the Crows Nest Pass Coal Co. was formed, with Mr. Fernie as a Director, in season and out of season, through good and evil report, in the face of opposition—which at times threatened to swamp the undertaking—he never ceased to labor and scheme for the building of a railway and the development of mines; devoting all his time and pledging his last dollar, and it is only a fair tribute to his British pluck and energy to say, that but for the tenacity and ability with which he clung to his pet scheme, there probably would not have been either a Crows Nest Railway or coal mine to-day. Mr. Fernie has had a remarkable career, of which this, possibly the most important coal project in the world, is a fitting climax. The son of an English country doctor, educated and trained to follow his father's profession, at twenty he ran away to sea, sailed nearly round the world, reached San Francisco in the early fifties, became a gold miner there and, subsequently, in Briti h Columbia, being one of the earliest pioneers of the Fraser River placer mining, and afterwards going with the rush into the Cassiar and Caribou country. Attracting public attention he became Gold Commissioner and Government Agent, and for some years ruled the Indians and miners with a rod of iron in the Fort Steele division of East Kooteney, winding up his career in connection with the Crows Nest coal areas. To-day, at sixty-five years of age he has retired to enjoy a well earned rest, and it is some satisfaction to know that the reward of his industry has furnished him with ample means to do so.

I have dwelt on personal matters to this extent because it is not always that the men who deserve credit in connection with onerous and difficult mining enterprises get it, and there is certainly no calling in which high qualities of character are more often demonstrated.

The coal areas referred to lie longitudinally upon the western side of the first range of the Rocky Mountains near the boundary, which separates British Columbia from Alberta. Coal seams are found in the Cretaceous formation, and are inter-stratified principally with sandstone and shales, super-imposed upon carboniferous limestone, and below this proceeding westerly we find the Cambrian rocks. The extent of the coal field is theoretically ninety miles long, running north from the south fork of the Elk River, but the actual limit of the coal basin, which is undisturbed, and can be counted upon to yield workable coal, extends only a distance of forty miles north of this point where the limestone comes to the surface, and the coal measures are so broken up and disturbed as practically to terminate at a point four or five miles north of Michel Creek. The exact southern limit is from four to five miles south of the North Kootenay Pass. The western limit of the basin is defined by the Elk River, all along the west bank of which the limestone outcrops and forms precipitous mountains. The eastern limit is determined by a line running north and south, at an average distance of nine to ten miles from the Elk River. Allowing for the large areas which have been eroded between the various mountain peaks in the creeks, it is probable that the nearest estimate obtainable of the area of workable coal is not less than 150 square miles, and Dr. Selwyn, the late head of the Geological Survey, computed the available coal to each square mile at 24,976,000 tons.

The coal measures lie in a long and narrow synclinal trough, the strike being due north and south. The western outcrops upon the mountain sides are at an elevation of from 1000 to 2000 feet, and upon the eastern side near Martin Creek, from 500 to 1000 feet above the level of the trail As the creeks are traversed they gradually rise into the measures and the outcrops are exposed on the level of the trail which gives the easiest possible access. The question of the exact extent of this basin will be determined by the geological survey, which is now being conducted, but the limits here given are probably correct. It is possible that there may be areas of detached coal between the limestone ridges a considerable distance north of Michel Creek, but there can be no large area favourable for working outside the basin indicated. The southern boundary is easily determined by the character and pitch of the rocks, all of which are much disturbed, and are frequently flexed with over-turning folds to the east. Along the trail which crosses the North Kootenay Pass the Cretaceous rocks are found, dipping to the north at an angle of 40 degrees, and at this point there is also a large fault with a throw to the east of not less than 1,500 feet. Another large fault crosses the River Elk near the bridge, so that while

the coal seams have been found outcropping in the south fork or Wigwam River they cannot extend any considerable distance in that direction. Dr. Dawson estimated that the exposures in the Crows Nest Pass indicate a total thickness of 7,000 feet of Cretaceous measures and 9,610 feet of limestone, and it is worth noting that his estimate at the Crows Nest summit and the North Kootenay Pass is the same.

In connection with the geological formation of this coal field, there are two interesting problems, one of which has been solved, and the other is in a fair way to solution. The first only became a problem in 1893, when disregarding the opinion expressed by Dr. Dawson in his reports of 1882 and 1885, the theory was broached that this coal basin contained two distinct series, which were designated the Elk River series and the Martin Creek series. The former was declared to contain twelve seams, with a total thickness of 151 feet of coal, and the latter twenty seams with a total thickness of 132 feet. This has been proved to be an error: there is really only one series. The exact number of seams has not yet been ascertained, as the areas are not fully prospected, but the result will be to cut down the workable seams of bituminous coal to something like eight or ten, and to reduce the aggregate thickness to 120 feet. In the former computation a large number of seams of bituminous shale were included, under the head of "Cannel" coal, but no true "Cannel" has been discovered, and these can be eliminated. In this connection it is worth quoting the opinion of Dr. Dawson in his report of 1885, at page 76, B. where he says: "The horizon is probably identical, and the general effect of the section is that of a wide, low synclinal, there is also every reason to believe that the coal bearing horizon here met with is the same as that discovered east of the Crows Nest Lake, and though the exposures are few near the main or water-shed summit, it is not improbable that the same horizon may be found there occupying the trough of a synclinal midway between the upper summit and the crossing of the east branch of Michel Creek."

The second problem mentioned has reference to the possible extension of these coals on the eastern side of the Rockies, in the direction of what is known as the Gap. As the Cretaceous formation is found here great hopes have been expressed that the same class of coal would be discovered. These hopes have not yet been fulfilled, although excellent coals have been found. At Livingston a seam 6 feet 6 inches thick has been prospected by tunnelling to a depth of several hundred feet, and further south near to the Mormon settlement at Cardston, a number of sections have been taken up, which contain outcrops of valuable coal, on the banks of the St. Mary River. This coal shows an analysis 4.05 per cent. of ash, and 91.20 of volatile combustible matter and fixed carbon, and by fast coking yielded a firm, coherent coke. It is too soon yet to pronounce definitely upon how it will compare with the Fernie coals, but further exploration in this direction will be carefully watched.

The pioneer work in the Pass, with which the writer is more closely identified followed that dealt with above, and commenced in 1897. Called upon to open up these seams in a new country and amid conditions the most unfavourable, it was at the time no easy task. The location decided upon for first openings, Coal Creek, was then 105 miles from the nearest railway station, Fort Macleod, and forty miles from the Crows Nest summit. The country all along the valley of the Elk was heavily timbered with magnificent belts of tamarac, fur, spruce and cedar running as high as 300 feet, and with trunks six to nine feet in diameter. The under growth was dense and there was no clearing and no passage except the Indian trail. The difficulty of commencing mining operations was greatly increased by the fact that these could not be delayed until the railway was constructed, the company being under an obligation to furnish coal by a given date, in order to secure their land grant, so it became a race between railway and coal mine. The railway construction was commenced at Fort Macleod in July, 1897, and the prairie road, as far as the summit, was available in March, 1898.

Meanwhile operations had been commenced in the coal measures at Coal Creek in November, by the gang of men who were taken in to assist in prospecting. The first miners employed arrived in December, 1897, and were Welsh-men, they pitched their tent and hung out a sign claiming to be the pioneer coal miners of the Pass. The railway did not reach Coal Creek until August, 1898, and meanwhile supplies of every kind had been hauled, at first from Fort Macleod and afterwards from the summit over a "tote" road, the like of which has probably never been seen in the west. Much of the material had to be "packed" in, and a "pack train" of ten to twenty horses was kept constantly at work, the cost, when roads were at their worst in the spring, running as high as five cents a pound from the summit to the mine. This was due largely to the execrable character of the road, which after leaving the summit, and especially along the low lying valley of the Elk River was a simple clearing over-soil consisting of five to six feet of alluvial mud The character of the road can best be imagined from the experience of the writer, who, with a first-class team never made the journey from the summit to Coal Creek, a distance of thirty-three miles in less than two days, and often required three. In spite, however, of these drawbacks. when the railway reached the mine there was a stock of 10,000 tons of coal banked out, and more than 4,000 feet of heading had been driven. Plant and machinery of every kind had been so ordered as to reach the mine as soon as the railway was open, and 100 car loads of material was waiting at various points, between Winnipeg and Macleod to be pushed through when the road was ready. With a plentiful supply of timber near at hand it was possible to get all bridge and trestle work hewn and hauled into position, and within four months of the railway reaching Coal Creek everything was in running order, there was a daily output of 300 to 400 tons of coal and 50 coke ovens were producing coke.

As the coke industry was the "raison d'etre" of the establishment of these works it is appropriate that I should refer to the quality of the coke although it is not necessary three years after it has been in the market to say anything in its praise.

I will simply remark that regarded in all respects there is no other coking coal in the world which is equal to it, even the celebrated Durham coal which furnishes the next best coke is inferior in purity.

I append the following comparative analysis of coke:—

	Carbon.	Ash.
Crows Nest, British Columbia.....	91.97	8.03
Crested Butte, Colo	89.00	11 00
Cardiff & Sunshine, Colo.....	87.18	12 82
Belt Montana washed coal.....	91.00	9.00
Connellsville, Pa.....	86.88	11.54
Trinidad, Colo. washed coal.....	85.00	15.00

Another analysis of a seam which has not yet been worked, but of which I took a sample, shows even better than this, viz., carbon 95.98, ash 4.02. An average analysis of the raw coal gives fixed carbon 73.04, volatile matter 21.13, water 2.75, ash 3.08, the yield of coke varies from 68 to 73. To make one other comparison let us take two of the most celebrated Welsh coking coals, the Park, which gives in coke as follows: Carbon 89 72, ash 8 50, and the Ogmore patent coke made in the Coppee ovens: carbon 92.26, ash 7.74 From this it will be seen that Crows Nest coke does not suffer by comparison with the very highest standards. The effect of putting such a coke as this upon the market is well known to most of you, in that it has entirely replaced Welsh and Connellsville coke, which had to be imported at enormous cost to help out the very inferior local coke, which was previously

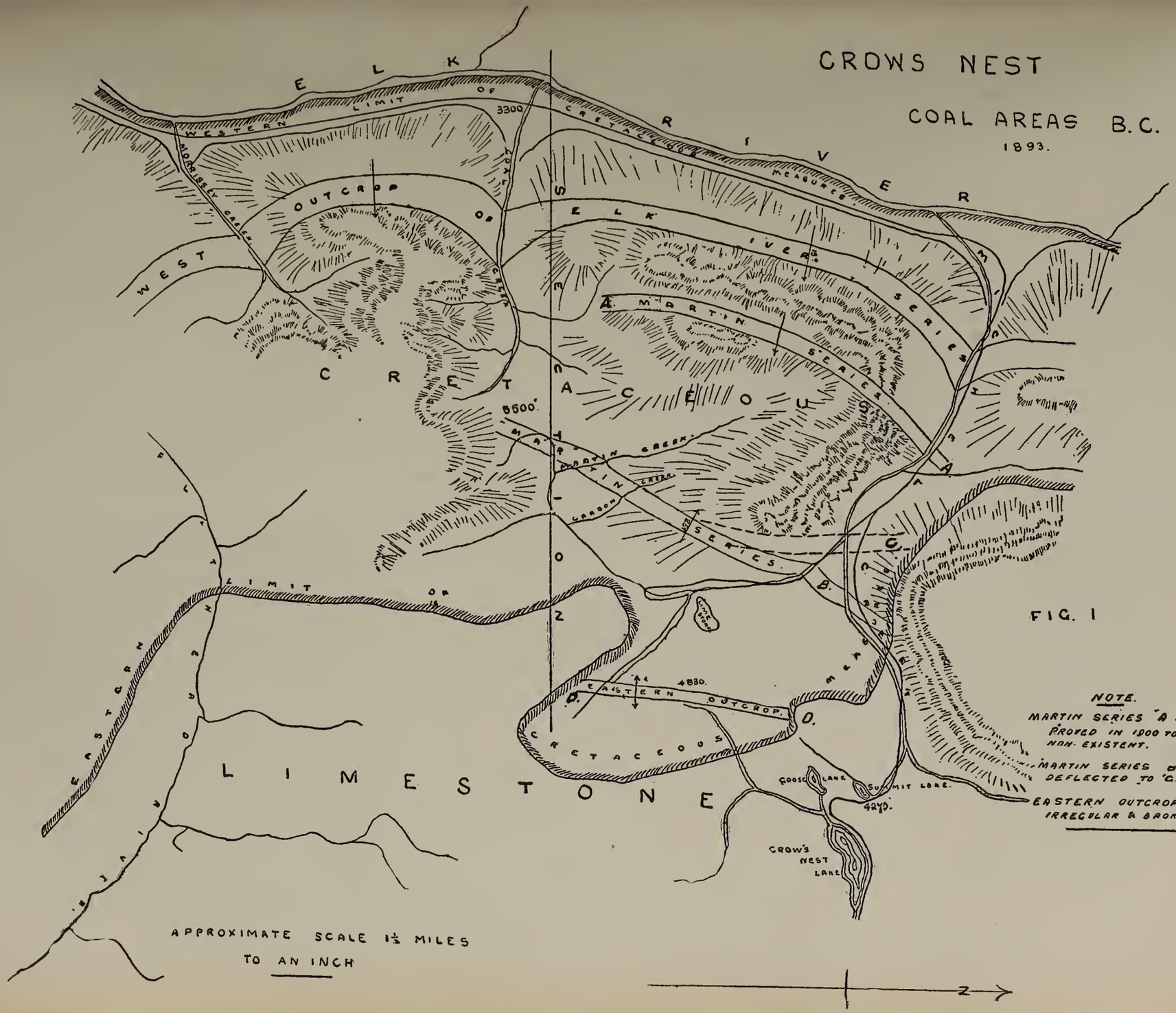


FIG. 1

NOTE.
MARTIN SERIES "A-A" PROVED IN 1900 TO BE NON-EXISTENT.
MARTIN SERIES "B" DEFLECTED TO "C."
EASTERN OUTCROP "O.O." IRREGULAR & BROKEN.

obtainable. The cost of this imported coke ranged from $15.00 to $20.00 a ton, laid down at the smelters, whilst Crows Nest coke costs about $7.00, and the reduction in smelter charges already effected has been largely due to this factor. The coal, whilst not an ideal one for domestic purposes, is still far better than any other obtainable in the West, and with a strong draught burns admirably in stoves, but is not satisfactory in open grates, as it cakes and becomes dead. For blacksmithing purposes it is an ideal coal on account of its great heat and its comparative freedom from sulphur. For steam getting it has demonstrated its superiority to any other western coal. It is worth noting here that two years ago the British Admiralty took 500 tons at Victoria, for a test upon the Admiral's Flagship which was just then starting for England by way of the Horn. So satisfactory was the result that I received a cablegram from the first calling place, Matanzas, stating that the Admiral had found it to give much better results than anticipated, and was so enamoured of it that he had cabled to the Lords of the Admiralty requesting them to arrange for its use on the Pacific Coast. When development has proceeded further and a larger tonnage is available there is no doubt that the English and American Pacific squadrons will use this coal. The question of a general market need not be discussed, beyond saying that, with such an unlimited supply there should be no difficulty in meeting all requirements, and I am satisfied that the quality of the coal and coke is such, that it must dominate the western market entirely. It is as indispensable to our American cousins across the border as to Canadians, and I anticipate that in less than five years this coal field will supply the entire consumption of coke in British Columbia, Montana and Washington Territory, and probably 50 per cent. of the raw coal required. Allowing only for a moderate development this would mean a daily output of not less than 10,000 tons of coal, and possibly more.

We must glance in passing at the conditions on which this coalfield is occupied, and the safeguards which the legislature has wisely enacted in the interests of the country. The local legislature of British Columbia and the Federal Parliament, by legislative enactment, have made over to the Crows Nest Pass Coal Co. by way of subsidy for the construction of the railway, 250,000 acres of coal lands, of which however, 50,000 have to be ceded to the Government to be disposed of as they see fit in the interests of the country, in order to secure an adequate supply of this coal to the public at a reasonable price. The protection thus sought to be given is a very necessary one, and the clause embodying it is carefully drawn, for it explicitly states that the 50,000 acres shall be of "equal value as coal lands with the residue of the coal lands." These words "of equal value" practically determine not only the question of quality in the coal but of location and access. The only practicable entry to the coal seams of the Crows Nest basin is in the creeks, because on the mountain sides the outcrops are too high and except in the creeks there is practically no flat-land at the base of the mountains upon which to erect the necessary works. All that is necessary, therefore, is that the Government shall see that this clause is complied with, and the selection judiciously made in accordance with the spirit of the provision.

I will conclude by briefly describing the appliances, plant and machinery installed at Coal Creek for the operation of the first mines opened there. I may state that the mines are five miles from the town of Fernie, the latter being situated on the banks of the river Elk There is an electric power plant, which furnishes power for lighting the surface and mines, coal cutting, pumping and hauling. It is driven by a Polson horizontal engine, 16 x 16 inches, at a steam pressure of 100 lbs. The dynamo, is driven by a twelve inch belt, and runs 600 revolutions per minute. It is a direct current, constant, potential dynamo, 150 horse power, over-compounded 10 per cent. It supplies pressure on the line at 220 volts. The capacity of the dynamo is 250 volts or with no loading 400 amperes. There are two Polson locotubular boilers, supplying steam at 100 lbs. pressure. The main haulage is conducted upon three systems, necessitated by the exceptional undulation of the floor, and I may here remark that this is one of the greatest difficulties to be contended with in mining these seams. It is not uncommon to start with a normal pitch of fifteen degrees, find this flattening out gradually until the coal becomes level, this pitching down again at twenty degrees. This actually occurred in the first main dip and of course disorganized the haulage. Upon the main level haulage is operated for 3,000 feet by a Jeffrey electric locomotive of seventy horse power. The weight of the locomotive is 2,000 lbs., there is an over-head wire and the haulage works on the trolley system. This installation has been thoroughly successful and has worked upon an even steeper grade than it was designed for. Upon a grade varying two to four degrees against the load it has hauled out 1,000 tons in twenty four hours. The secondary haulage is supplied by an electrically driven stationary hoist of twenty-five horse power. It is geared between the armature and the drum at a ratio of one in twenty-five, which gives the rope a speed of two miles an hour. This hoist hauls up a main dip of an angle of fifteen to twenty degrees against the load. It is stationed 1,500 feet inside the mine and works satisfactorily. From the working places to the mechanical haulage the coal is conveyed in cars drawn by horses. There is an installation of coal cutting machinery consisting of two electrically driven coal cutting machines, of the chain type, supplied by the Jeffrey Co. These have not been as successful as expected owing entirely to excessive grades and the irregularity of the pavement which makes it difficult to move them from stall to stall, but when in operation they have given the best results and upon easier grades have demonstrated their capacity. An installation of compressed air is now being made for the purpose of introducing percussion cutters which will probably be more suitable in such steep seams. The method of working adopted is the "pillar and stall," it being impossible to resort to longwall under such an enormous cover. It has been found necessary to leave very large pillars and in spite of this the crushing has been sufficient to close one section of workings. It must be remembered that this coal is exceedingly soft and friable and does not stand well, even where the pillars are left of exceptional size. It may yet be necessary to resort to square work, the system generally in use in the Old Country in thick seams.

At the present time the output at Coal Creek is from 1,200 to 1,400 tons a day, and is expected to be largely increased this year. It may be worth noting that the output in 1898 was about 60,000 tons; in 1899 100,000 tons; in 1900 240,000 tons.

The ventilation is produced by two of Murphy's reversible fans, yielding respectively thirteen, and seventy thousand cubic feet of air per minute. These however, were only installed temporarily for development work. There is a large Chandler fan, fifteen feet in diameter, capable of producing 300,000 cubic feet of air per minute, with a water gauge of three inches, and other installations of ventilating machinery will shortly be made in consequence of the large quantity of gas yielded by the workings. In this connection it should be noted that the altitude of the mine, about 4,000 feet, gives very low barometer readings, varying from 24 to 25 inches; and during atmospheric depressions the pressure per square inch does not exceed twelve pounds. Add to this the fact that a large quantity of coal dust is produced, and it will be seen that great care has to be exercised in connection with the ventilation. A thorough system of watering has been introduced with excellent results. Very little pumping is required in the mines at present and the only machine in use is a Tripley pump, electrically driven. It has a three horse power motor, 220 volts, 400 amperes, and is geared direct to the crank shaft, at a ratio of twenty to one. The diameter of the pump rams is three inches, length of stroke

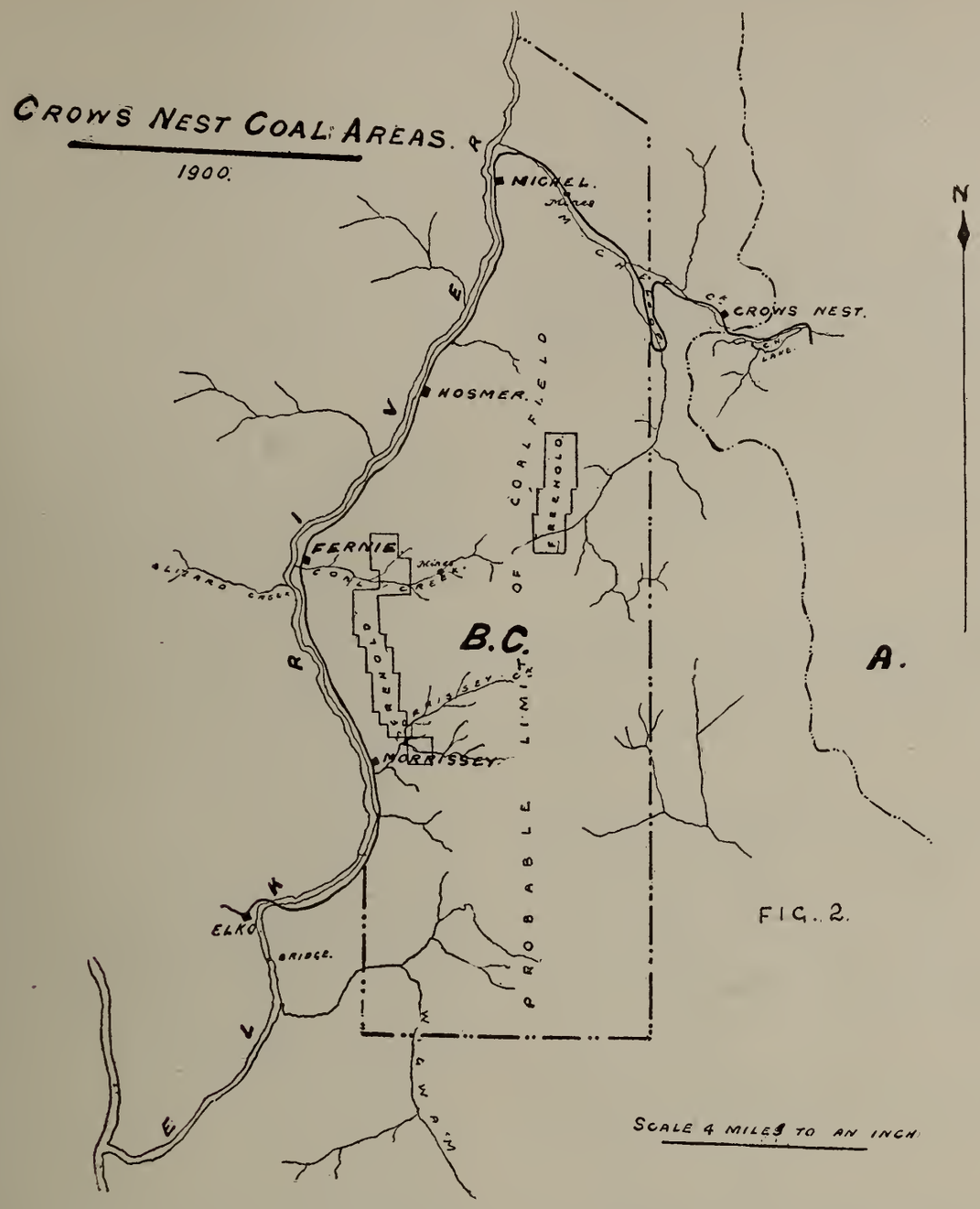


FIG. 2.

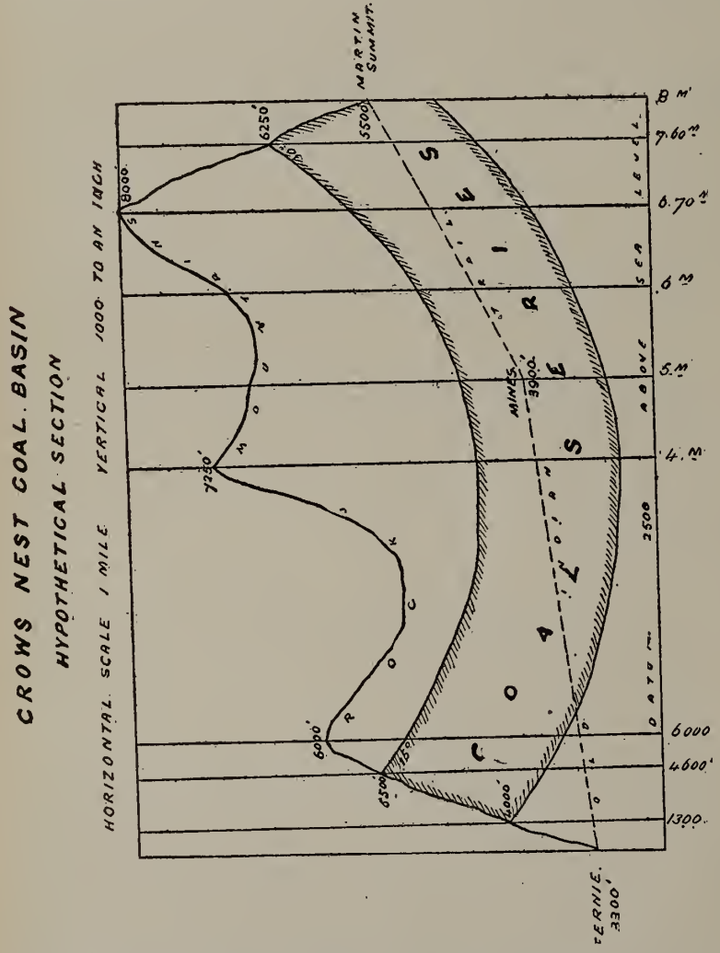
three and a half inches, number of strokes sixty, capacity seventeen gallons per minute.

Upon the surface in addition to the power plant, already referred to, there is a large and costly trestle, which had to be built from one side of the creek to the other, 1,000 feet, in order to give access from the workings to the screen house; it has an elevation of thirty feet, with four parallel tracks, and the locomotive runs right up to the dump. There is a large screen house containing a modern equipment of shaking screens, twenty feet long by five feet wide, with a working speed of 100 strokes per minute by six inch stroke. The inclination of the shaker is seventeen degrees dip towards the discharge. The large coal passes over this screen to a travelling picking belt, sixty feet long and five feet wide, which moves at the rate of forty feet per minute and discharges all the large coal into the cars. Nuts pass through the first screen and fine through a second screen, so that there are three divisions of coal; all the fine is taken to the coke ovens. The tippler, which plays an important part in dealing with the whole of this output is a Mitchell. It is capable of dealing with 2,000 tons in ten hours, and is so arranged that the falling cars release the wheel grips of the empty car; after it has been emptied they run forward down a five per cent. grade for a distance of fifty feet then back on another track, falling five per cent. for the same distance to the side of the tippler. Having reached this point by gravity it is taken hold of by a "creeper chain," which lifts it up a fifteen degrees incline to a sufficient height to permit it again to run forward by gravity to the empty track, ready for attaching to the locomotive. The whole of this plant which is operated by an engine 12 x 12, the motive power being conveyed by chains and sprocket wheels, was manufactured by I. Matheson & Co., of New Glasgow.

The surface tracks are arranged in the "gridiron" fashion" being parallel and connected both at the extreme elevation and at the lowest point with the branch line. When a train of empty cars is brought in it is pushed above the top switch and left there; the cars are then allowed to fall by gravity, as required, and are diverted by the switch to whichever track is necessary. Afterwards they fall by gravity also below the screen house to the siding where the out-going train is made up, in this way no mechanical power whatever is required on the surface. The grade of the siding is .75 degrees.

The coke ovens are erected five miles from the mine, at Fernie,

upon a large plateau. At present there are 312 in operation. There is a special arrangement of tracks and bins to ensure the most economical handling, and as a matter of fact from the moment the coal is loaded into the cars at the working places in the mine until it is raked out of the ovens in the form of coke it is never touched by hand. It falls automatically from the tippler to the screen, is separated and passes into the railway cars, falls by gravity from the screen to the out-going siding, is hauled by a locomotive to the side of the coke ovens, where it is discharged through bottom door hoppers into a large bin, with a storage capacity of 5,000 tons. From the under side of this bin a low level track passes, with a slight falling grade to the top of the coke ovens and an electrically driven lorry carries the coal the full length of the ovens and discharges through a side shute into the holes. The ovens are of the ordinary bee-hive shape, twelve feet in diameter. They are placed in double rows, and the railway track runs between each set of ovens at a distance of about thirty feet from the doors. The average charge of coal is 6.5 tons (of 2,000 lbs.); the production of coke per charge averages 4.50 percentage, in coke 68 per cent. Time of burning seventy-two hours, average output for each oven per day 1.5. The



ovens are built of sandstone, which is quarried in the Pass, and are lined with fire-bricks, which have to be imported either from Scotland or Pennsylvania. The cost of these bricks laid down reached the enormous figure of $70.00 per thousand, and it is to be hoped that a suitable fire-clay may yet be discovered in the Province.

Although not directly a branch of mining it is necessary to say that in such a country, as I found at the Crow's Nest Pass in 1897, mining operations were not the only ones which had to be conducted. A townsite had to be selected, cleared, divided into lots, sold, and built upon. Many of you have been there; to those who have not I may say that in one year from the time that operations commenced the town of Fernie was one of the most prosperous in British Columbia, with a population of nearly 2,000 people, with a water works system, electric lighting for the streets and houses, good side-walks and a prosperous community.

This sketch is only intended to give a general idea of the opening up of a new concern in what has been called the "Wild and Woolly West," but which from my experience I would be disposed to call the "Wild and Woody West." The Crow's Nest Pass coal areas have had a start, and they will well repay for watching. I consider that they will furnish the key to the success of western mining and settlement. They certainly contain one of the most valuable, if not the most valuable, of our mining deposits, and long after those who were engaged in the pioneer work of the section have been called to another sphere, western Canada will be enjoying the fruits of their labours.

A Powerful Hydraulic Dredge.

There is at the present time being built at the Polson Iron Works, Toronto, Ont., the most powerful and complete dredging machine in the Dominion. It is a self propelling hydraulic dredge, which has been ordered by the Government, for the improvement of the Fraser River, and the Pacific Coast ports of British Columbia.

The rapid advancement of this Province has made it necessary to deepen the harbors and channels so that ships of large capacity can navigate with safety, and after long and careful study of the question it was decided to build a powerful dredge of the special type referred to, which although primarily intended for the Fraser River, can steam itself to any point and do a great variety of work.

The dredge has a capacity of 1,000 tons per hour, dredged and delivered at a distance of 4,000 feet. This is accomplished by an immense centrifugal pump about 11 feet in diameter, having a steel suction pipe which can be lowered to a depth of 40 feet. At the end of the suction pipe is a powerful rotary excavator of steel, which can cut or disentegrate any material short of rock or large bowlders. This material is then sucked up by the pump with sufficient water to carry it along at the rate of 13 feet per second, and discharged through a pipe. The dredge is arranged so that it can discharge in any desired way, either into scows, or over an embankment, or to a long distance through a flexibly connected floating pipe.

The boilers and engines on the dredge are of 1,000 H. P. The engines are of the triple expansion surface condensing type, with water tube boilers capable of carrying 225 lbs. working pressure.

The dredge is fully equipped for either fresh or salt water service with complete appliances of the latest pattern and fully up-to-date. The hull has a steel frame throughout, and will be shipped from Toronto in sections, and put together in British Columbia, where it will be sheathed with wood.

The main deck of the dredge is entirely devoted to machinery while the upper deck contains accommodation for the officers and crew. Here are several staterooms, separate mess rooms for the officers and crew, kitchen, pantry, bath room, etc. The dredge is fitted with electric light, and has a complete machine shop for making ordinary repairs while in remote places. The dredge is also a complete self-propelling steamboat, with pilot house and steering gear, so that when her work is completed at one locality (which will not take long owing to her large capacity) she can pick up her anchorage and go to another.

The designer of the dredge is Mr. A. W. Robinson, M. Am. Soc. C. E., a Canadian Mechanical engineer, whose work in this line is well known in the United States, and abroad.

It is a matter of congratulation that this dredge is entirely a Canadian production, and that we possess sufficient enterprise, and have the manufacturing facilities to execute the entire work in one

establishment. The Polson Iron Works not only build the hull, but also the main pump, triple expansion engines, propelling engines, auxillary engines, and water tube boilers, and in fact the complete dredge, set up and delivered under steam at its destination, ready for work.

The construction of this dredge marks a new era in the method of carrying on our public works in which dredging is required. The modern demands of increased capacity and economy have developed high powered dredges capable of doing from six to ten times the work of the old fashioned machines of a few years ago, and at a fraction of the cost.

Mr. Robinson has also designed a still larger dredge for the St. Lawrence Ship-channel. This dredge is also being built by the Polson Iron works, and will be one of the most powerful in the world. The hull is entirely of steel 160 feet long, 42 feet beam and 12 feet 6 inches deep.

It has a 36 inches floating discharge pipe 2,000 feet long, carried by cylindrical pontoons wholly of steel, which will weigh 400 tons.

Mr. Robinson has been commissioned to examine the seaport channels of Nova Scotia and New Brunswick, with a view to designing a large self-propelling dredge, which will be suitable to the conditions there existing.

Mr. Robinson has designed and built over one hundred dredges of all kinds, and his experience has enabled him to bring them to a high state of perfection. Mr. Robinson is now engaged as consulting engineer on a contract for deepening the Ship-channel of New York harbor, and has just completed a dredge for that work having a capacity of 40,000 cubic yards per day.

MINING IN QUEBEC.

The mill of the North American Graphite Company, near Buckingham, will make an experimental run on a tonnage of graphite shipped from the mine of the Ontario Graphite Company, near Perth, Ontario. The agreement with the Cameron Syndicate having terminated the North American Graphite Company will resume work on its mines.

Mr. Obalski, Inspector of mines estimates the production of Asbestos in Quebec during the year ended 1st January, 1901 to have been :—

1st class crude.....	1,755	tons worth.....	$210,250
2nd class crude.....	3,490	" "	182,640
Fibre	16,368	" "	326,526
Total Asbestos.....	21,613		$719,416
" Asbestic.....	7,935		15,948

Commenting upon the industry he says :—

"During the past year, this industry assumed a development which equalled that of the best periods of its history and prices rose proportionately high. First class crude, which was selling last year at $100 to $110 reached $180 to $200 ; the second class $80 to $100 ; the fibre $30 to $40 and the other qualities in proportion. The demand also greatly increased and necessitated the taking on of a larger number of hands, night work in some cases, and an increase of the capacity of the mills, etc. In addition, mines that had been unworked for some years were re-opened. This prosperity applies to the districts of Thetford, Black Lake and Danville and the best illustration that can be given of it is supplied by the fact that the mining companies voluntarily raised their rate of wages 25 per cent.

The Capelton copper mines were regularly worked and yielded 33,742 long tons of low grade ore worth $150,152 at the mine, about one half of which was shipped to the United States and the remainder utilized on the spot. The Enstis and Nichols mines were worked during the whole year, employing 270 men, 185 of them underground and the others on the surface, the wages paid footing up to about $70,000. The Nichols Chemical Company has built a wing to its works for the manufacture of muriatic acid. It also prospected the old Sherbrooke mine. located on lot VII, 12 of Ascot, where ten men have been employed since July. A shaft, dipping 45° to the South East, has been sunk on a 6 feet vein running North East. About 175 tons of ore had been taken out at the time of my visit in October. A small 10 inch vein has also been noted to the South East of the first.

Important deposits of manganese are being opened on the Madelaine Group of Islands, Gulf of St. Lawrence. The development of these deposits is being carried on by Mr. W. G. Tait, of Picton, N.S., who owns the mining rights.

Of the Mica industry Mr. Obalski says :—

The reports received from the companies working in this province give the following summary :

1″/3″ thumb-trimmed....	338,200 lbs.	worth....	$31,860
2″/3″ " "	92,359 "	"	18,534
2″ 4″ " "	71,332 "	"	24,953
3″/5″ " "	25,637 "	"	15,706
4″/6″ " "	11,762 "	"	11,451
5″/8″ " "	1,995 "	"	2,696
Total.....	541,285		$105,200

Say 270½ tons.

To this figure must be added a certain quantity of mica prepared but not sold, still remaining in the hands of the producers and representing 64½ tons of thumb-trimmed mica of various dimensions but generally large-sized, worth $33,400 at the average market prices of the year, making a grand total of 335 tons, worth $138,600, besides about 150 tons of rough culled mica estimated to be worth $25,000. The prices of thumb-trimmed mica sold by the barrel have varied very much from the beginning to the end of the year, having fluctuated between the following limits :—

	cts.		cts.
1″/3″	7	to	15
2″ 3″	18	to	35
2″/4″	30	to	40
3″/5″	45	to	60
4″/6″	75	to	1.00

5″/8″ and over from $1.25 upwards.

It will be observed that during the year the demand for small sized mica was greater than that for the large sized.

Mr. John J. Penhale, for many years Superintendent for the United Asbestos Company, at Black Lake, and who for the past year or two has been gold mining in Oregon, has returned to the Eastern townships. It is reported that the United Asbestos Company has leased its property to an American Syndicate, the Manhattan Asbestos Mining Company, and that Mr. Penhale will be the manager of the new company.

Important additions are being made to the mining and milling plant at the Union Mines, Black Lake, formerly worked by the Wertheims.

A new company to be known as the Standard Asbestos Company, is being organized to acquire and work the property formerly operated by the Anglo-Canadian Asbestos Company. The Canadian Asbestos Company operates the mines and plant of the Glasgow & Montreal Asbestos Company, under the management of Mr. J. F. Phair, formerly mine manager for the Asbestos and Asbestic Company, at Danville.

At the fourteenth annual meeting of the Asbestos Club held on 25th ultimo, the following officers were elected for the ensuing year : President, R. T. Hopper ; first vice-president, R. Stather ; second vice-president, R. D. Whitney ; secretary-treasurer, D. Wilson ; assistant-secretary, W. A. Clearihue.

Great activity in asbestos production goes on at Thetford Mines where the Bell's Asbestos Company, under the energetic management of Mr. George R. Smith, M.L.A., King Bros., under Mr. B. Bennet, and the Johnson's Company are all working on an extensive scale. Large as the value of the output was last year, 1901 promises to be the banner year in the production of Canadian Asbestos.

LAKE OF THE WOODS.

Sultana Mine.—A recent run of ten days at the Sultana produced a brick of 180 oz. worth about 3,000. Connections have been made at the fourth level between the old workings and the new workings on the Crown Reef. Some very high grade ore was encountered during this development. Assays as high as $160 per ton were obtained but it is expected that the ore will mill about $10 on the plates. The mill is still working ⅔ time but will shortly be running night and day.

Mikado.—This mine is producing its regular quota of gold bricks monthly. The incline is now over 900 feet down. Work is proceeding satisfactorily on No. 2 vein and a large amount of payable ore is being blocked out. The manager N. McMillan has gone to England on business connected with the company.

Homestake.—A large body of ore has been encountered in the north crosscut. At this writing the ore body has been penetrated for ten feet. The ore is a well mineralized dark blueish quartz and looks promising. A hoist and pump have been ordered and will shortly be installed when sinking will be proceeded with.

Regina.—The new manager of the Regina Mine, Mr. Peterson, is expected next week. A large amount of capital has been secured and active development will be proceeded with at once. It is to be hoped that the new management will develop the water power at Whitefish Rapids which is distant only four miles from the mine. There could be developed a constant power of at least 500 horse at a very moderate expense by the erection of a dam 20 feet high at this point. This dam would at the same time be a boon to the properties on Whitefish and Sturgeon Lakes as it would drown out Dogpaw Rapids and afford uninterrupted steamboat communication from Whitefish to the upper end of Sturgeon Lake.

Golden Horn.—A party has left for this property to unwater the shaft and resume development work.

Champion.—This property will be equipped with a new hoist and compressor plant, and mill at an early date. This property from a shaft two hundred feet deep and one hundred and twenty feet of level, has produced over $15,000 worth of bullion, and when equipped with an adequate plant will be a steady producer.

Triumph.—This mine owned by Alpena, Mich. people will be re-opened in June.

Pine Portage.—Arrangements are being made to resume operations on this property which was one of the first producers in the Lake of the Woods. This promising property affords another striking instance of tender foot methods in mining. Shaft in the worst possible place for convenience, a ten-stamp mill with a water supply from a creek that is bone dry for nine months in the year, and an antiquated man-killer of a horse whim for hoisting. There was no crusher and as a substitute the ore was dumped three or four times between the shaft and the mill. The management ran out of money before the mill was completed and it must have been an amusing sight to see the stamp stems playing up through the temporary roof. The character of the milling may be judged from the fact that one can pan quick by the spoonful from the tailings. Your correspondent has thoroughly examined this property and there is no doubt in his mind that Pine Portage will under decent management form a paying proposition.

Whitefish and Sturgeon Lake Districts.

Nish-Shish-in.—Work has been commenced on this prospect, which is situated on Sturgeon Lake, by the Michigan and Ontario Mining Company. Contracts for 100 feet of sinking have been let.

Thist Lake.—N. Higbee is working with a gang of men on a new discovery on Thist Lake from which great things are promised.

Gold Panner.—Operations on this property will be resumed at once.

Gold Winner.—This property is under option to an English Syndicate which will proceed to development in a few days.

Nino —This property which has developed one of the best showings in the District will be shortly equipped with modern machinery. A magnificent water power at Cariboo Falls situated a mile and a half from the mine will be developed to supply the power for the mine. A minimum H. P. of 500 can be depended upon all winter or during the direct seasons in summer.

Virginia.—The deal on the Virginia still hangs fire but it is to be hoped that this property will be taken hold of by some one who will give it the chance it deserves. Another instance—$40,000 expended—$10,000 of work done.

Wabigoon District.

Sakoose.—This mine has resumed shipping to the mill at Keewatin. A washout on the branch from Dyment interrupted shipments for several weeks.

Big Master.—A suspension of operations has been ordered and one drill only is running on the mine. A freeze out game is on and to an outsider it is evident that such a frost is necessary to check the reckless extravagance of the present management.

Grassy Bay.—The N. C. Westerfield Co. of St. Paul has begun operations on the McRae properties on Grassy Bay.

Twentieth Century Co.—This Co. is at last actively mining with compressor and steam hoist on its properties on the Upper Manitou. This company has already paid a dividend, a very creditable performance since said dividend was paid before a tap of work was done on any of its properties.

Cross Lake Mining Co.—This company, one of the Westerfield Companies is actively sinking on its property on Cross Lake.

Sairey Gamp.—This property operated by the Rainy Lake Power and Dev. Co. has shut down pending the installation of a more powerful mining plant.

Independence.—The erection of the ten-stamp mill which is on the ground will be proceeded with at once.

Wabigoon Iron Range.—An iron range of first class hematite ore has been located in the north part of Zeuland townships and a company is cutting roads and shipping the deposits. This range comes within a mile of the C. P. R. at Barclay, and if development shows any considerable quantity of such ore as prospectors have on exhibition, iron mining will become a feature of the Wabigoon District. Excellent samples of hematite are shown from Turtle Lake twenty miles south of Tache and exploration will be active in the Lake during the summer.

Eagle Lake District.

Golden Eagle.—This property known as the "Higbee" on Eagle Lake is being steadily developed with satisfactory results. The vein varies from 3½ to 5 feet wide, carries good values. The shaft is down 73 feet and at the 60 foot level a drift is being driven out to the hill-side for drainage and ventilation.

Viking.—This property is now under examination by prospective purchasers. The vein varies from 4 to 5 feet in width and shows a good deal of visible gold.

Grace.—J. H Carlor the owner of this property will begin development early in June. A mill run of surface ore of about ten tons made last summer gave an average of nearly two ounces per ton.

Baden Powell.—This property owned by J. A. Partington and associates of Rat Portage has within the last month produced the richest samples of "free" gold ever seen from the Eagle Lake District. Your correspondent saw a button of gold weighing 6 ounces that was panned out of surface rock by the prospector and his industrious wife.

El Dorado.—There is enough vein in sight with plenty of gold to make this property worthy of its name. There is a fine little two-stamp mill on the property with a boiler about half large enough to drive the engine, no crusher and a general air of ignorance pervading everything on the job. The same old story—good surface prospect—tenderfoot manager—must have a mill—gets it—don't develop—shuts down—general howl.

Sturgeon Lake District.

The excitement in this district still continues. It is estimated that a hundred canoes and three hundred men are exploring the shores of Sturgeon and other lakes in the vicinity. The government will cut a road to the mines from Ignace on the C. P. R. Peter King, the original discoverer and prospector says that by constructing a dam on English River, water power can be made available for all the mines in the neighborhood and at the same time back up the waters so that a tug can run from Ignace to Sturgeon Lake.

Seine River District.

Golden Star.—Capt. J. M. Jones, formerly of the Regina is engaged with a crew of 15 men unwatering and retimbering the shaft which was left in very bad shape by the former management.

Olive.—A meeting of the Olive directorate was held in Rat Portage last week and was adjourned to meet again in Toronto when the future policy of the company will be determined.

MINING IN NEW BRUNSWICK.

So much development of mining claims is going on in Nova Scotia and British Columbia, Ontario, etc., it seems almost unnecessary to say much as to mining matters in New Brunswick, nevertheless considerable money is being invested in one way and another at various points in the Province in hope of future paying results.

The difficulty, or one of the difficulties, is that while we have a Mining Law and a Mines Department at our Capital, Fredericton, we have no regularly trained Mining Director or head of a Department such as there should be, the mining business of the Province being merged with the duties of the Surveyor General and the mineral resources of the Province are practically unknown to the Officials of the Department. Those who are in charge, it can be said are obliging, painstaking and courteous, but there it ends.

With the possibilities of the Province in the mining line the government should have a capable Mining Engineer, and an assay office, so that the prospector could promptly and at reasonable rates get an idea of any values in mineral that might be met with.

New Brunswick possesses Coal, Iron, Copper, Antimony, Manganese, Shales, Asbestos, Nickel Ore or Pyrrhotite, Galena, Gypsum, Baryta, Salt Springs, Mineral Springs, Red and Black Granites, Tripoli, and at one or two points evidences of Tin and Cinnabar or quicksilver rock. In addition it is fairly evident that Oil and Natural Gas abound, and it is simply a matter of time and money to exploit these resources. At points in the Province evidences of gold are also to be met with but sufficient work has never been done in the way of prospecting or developing such indications as may have been met with.

That there is a firm idea that some of these minerals may yet come to the front, and on a paying basis, is evidenced by the fact of operations at a number of points which I will as briefly as possible enumerate.

In addition to the coal developments in the Grand Lake region of Queens County, prospecting is now going on at two points in Kent County. At one point called the Mount Carlyle Mine it has recently been reported that a 3½ ft. seam of coal has been discovered. This property is now bonded to some American Capitalists.

At Dunsinane, Kings County, a few miles east of Sussex, operations have been in force for some time past looking for coal and it is reported that 4 ft. of coal has been found. Rumours of a discovery of Anthracite between Hampton and Norton on the line of the I. C. Ry. have been rife, but it is not generally credited. One sample seen by the writer was a handsome specimen of Slicken Sided Shale from the Shale belt that extends from Dorchester to Hampton, on which at Hillsboro, Albert County, years ago the famous Albertite coal was mined and yielded enormous profits, but gave out; since then the material has not been found in quantity. It is stated a company has recently been organized, by a Capt. Colhoun of New York, in Montreal, to again work and develop this property, also the celebrated Baltimore Shales which have long been supposed to be valuable as an oil producer.

The New Brunswick Oil Company, a local concern, aided by, it is supposed, American capital, have already spent considerable money in boring for oil in the Memramcook Valley and are at present time conducting operations there. This company has secured very large concessions from the New Brunswick Government on lands at various points in the Province for oil and gas rights, and savours very much of a monopoly. The Government if oil is struck stands in to reap a handsome royalty while the local stockholders, owing to the political pull in which the company was organized will come in for fat dividends, or a ready sale for their stock.

At Dorchester for the past year or so quiet development has been going on on some copper areas now owned by an American concern with headquarters at Providence, Rhode Island. The concern has spent a large sum of money on prospecting and developing and have now almost ready a smelting plant, and at present time about 100 men are engaged in and around the works. It is known as the Intercolonial Copper Company and stock of same sells readily in the New England States. Later on I will try and give you a more detailed account of this somewhat important development, which it is confidently claimed bids fair to be a dividend paying concern.

Work of development at the Jordan Monoham Manganese Mine near Sussex, now controlled by some New York capitalists has been suspended

during the winter months. It is said work will again be resumed shortly. About 6,000 tons of ore is now on the dump waiting shipment.

Some work has been going on at Salt Springs, Kings County, N.B., the Government Diamond Drill being engaged in trying to locate the salt beds supposed to exist in the locality.

It is rumoured that the iron deposits of Upper Woodstock may be re-opened and that the D. S. & I. Co. of Sydney have their eyes on same. How correct this may be is uncertain but no doubt if the Woodstock ores could be mined and placed on seaboard auyway cheaply they would pay for operation as the iron is of an excellent quality.

The Pyrrhotite or Nickel ore mines near St. Stephen are as yet idle, but it is said some further work of development may go on this summer. Why this important body of ore, being right on the seaboard and possessing in point of transportation a vast advantage over the Sudbury products, does not interest capital is a mystery to me as well as many others. Time will however make this plain.

An important deposit of Antimony in York County, is now open for capital. It is intended to place matter in the hands of some London capitalists at an early day, so I understand. The copper proposition at Le Tete in Charlotte County await the advent of the capitalist. These are really well worth inspection and development. At Red Head, Charlotte County, is a huge deposit of iron and copper pyrites right on seaboard within 200 yards of deep water shipment the year through with vein 15 to 18 feet wide. The surface ore carries from 39 per cent. to 44 per cent. sulphur. Strong traces of copper and also carries a fair percentage of gold. Mining experts say that if developed to depth of 75 to 100 feet it will result in a first class copper producing belt. The property is open for capital on most liberal and easy terms. I must however not trespass on your space further and during the next few weeks will note what is going on and advise you.

PORT HOOD COAL.

The following is excerpted from the 1st annual report of this company :—

The work of developing and equipping the company's property has proceeded steadily, and with all practicable expedition during the past year. The slope was sunk to a depth of between 1,100 and 1,200 feet, at which point levels are now being opened out. The character of the seam and the quality of coal have sustained the most favorable expectations of the Directors; the seam at the depth reached exceeds seven feet in thickness and the coal has proved to be superior for steam producing and domestic purposes to most of the coals on the market.

The work of construction on the shipping pier was carried to a length of about 1,400 feet—giving a depth of about eighteen feet of water and will be further prosecuted during the winter and early spring with a view to its completion for the opening of navigation.

During the late autumn months several storms of almost unprecedent violence swept this part of the coast of Cape Breton, but no damage whatever was done to the company's property, an evidence your Directors think, that the pier has been well located and well constructed.

Machinery for the permanent equipment of the mine has been ordered, and all necessary materials for the overground construction work, bankhead, etc., are being assembled as rapidly as possible.

Mr. Bartholomew's engagement as Manager having expired on September 30th, your Directors did not consider it expedient to renew it. They subsequently engaged Mr. John Johnston, late assistant Manager of the Dominion Coal Company, as Manager, and he comes to the Company's service with the highest testimonials for varied experience and practical ability. Under his energetic administration your Directors look forward confidently to an early completion of all equipment work, and the placing of the mine among the large coal producing properties of the Province.

The outlook for the coal business continues to be very satisfactory, last year's prices are well maintained, and the production of our provincial collieries is unequal to the steadily increasing demand; there is every prospect that we shall be able to market our output advantageously to the company's interest.

BALANCE SHEET 31ST DECEMBER, 1900.

LIABILITIES.

Capital Stock	$750,000 00	
Coupon Bonds	750,000 00	
		$1,500,000 00
Accounts payable	3,730 61	
Coupons and accretions to date	13,979 00	
Equipment reservation account	1,823 74	
		19,533 45
		$1,519,533 45

ASSETS.

Property		$1,225,079 50
Mine development	$ 26,800 62	
Less Coal Sold	4,873 99	
		21,926 63
Equipment of Mine		18,025 86
Pier		39,856 01
Reservoir		5,447 43
Bonds and Stock held as security	177,300 00	
Contingent account	5,280 00	
		182,580 00
Cash, current bank account	1,565 39	
Deposit receipts	25,000 00	
At Mines	52 63	
		26,618 02
		$1,519,533 45

PAYNE CONSOLIDATED.

The following is excerpted from the Director's Report for the year ended 31st March last, submitted 14th instant :—

During the past year Mr. C. H. Hand has severed his connection with the Company as Manager. The Board, on recommendation of Mr. Hand, appointed Mr. W. E. Zwicky, manager, as his successor, Mr. Hand agreeing to pay occasional visits to the mine.

In March last your Directors deemed it advisable to suspend the payment of dividends, owing to the scarcity of ore in sight above No. 5 Level. This level has been a disappointment in that it has not produced anything like the quantity of ore as found in the level above, and as estimated by Mr. Bernard MacDonald, in his report, at about the time this Company took over the property.

No. 8 Tunnel has not yet reached the ore chute, progress having been very slow, owing to the many drawbacks, to which your Manager makes reference in his report.

Your Directors have under consideration the advisability of installing a compressor and concentrator, to be operated by water power, and one of your Directors, Mr. F. B. Mathys, has recently paid a visit to the mine to thoroughly investigate and report on same.

MANAGER'S REPORT.

I have practically stoped out all the large ore reserves that were blocked out above No. 5 level. I am still stoping out smaller streaks above this level with profitable results. There is a large block of ground above No. 5 level, between raise No. 2 and chute 35, which I am now prospecting, and from present indications I believe it will produce considerable ore. Have extended Nos. 4 and 5 levels to the main fault.

I have done very little prospecting to locate the vein on the east side of this fault, but as soon as I get the winze connected with No. 8 will endeavor to locate it.

No. 5 level shows ore in the bottom in several places, and one continuous chute, from six inches to two feet wide and about 200 feet long, which looks very encouraging for the future of the mine.

The stopes between Nos. 4 and 5 levels were not as good as there was reason to expect from indications shown in those levels. Have cut a station at chute No. 46, in No. 5 level, and started a winze to be connected with No. 8 winze is now down about 60 feet, and as soon as it is sunk to a depth of 125 feet will start level No. 6. This winze has two compartments and is permanently timbered, and large enough to handle all output, materials and supplies necessary for the working of the property below No. 5 level.

Since assuming the management of the mine I have driven No. 8 tunnel 630 feet, making a total of 930 feet as a crosscut; thinking I might cut the vein that crops on the Thursday Fraction claim.

As I did not find it I believe I passed through a broken section of it, caused by a large fault we encountered about 700 feet in. After stoping No. 8 tunnel as a crosscut I started a level about 30 feet from the face of tunnel, the course being about the same as the strike of vein, and I expect to cut the vein on the turn of the fault as it shows in No. 5 level. I had about 230 feet to drive from crosscut, if the fault continued down on the same dip as it shows above No. 5 level. I have driven about 175 feet in this direction and have 55 feet yet to drive.

When I cut the vein I will then have to drive on it about 100 feet in a northerly direction, so as to be able to start an upraise to connect with the winze I am now sinking in No. 5 level. Will have to sink and upraise 329 feet more before winze is completed. Progress in tunnel No. 8 was very slow for many unavoidable causes, principally the large flow of water encountered in driving, the hardness of the rock, compressed air line freezing and danger from snowslides, making it very difficult to secure and keep good men at work.

I am now driving No. 8 tunnel by hand, on contract, owing to our pipe line giving out. I did not think it advisable to try and repair it at present, on account of the deep snow and danger from slides.

From my knowledge of the property and the indications showing as development progressed, I have every confidence that we will find large bodies of as valuable ore as has been produced in the past.

We are now in a position where we must install some kind of power to operate below No. 5 level and it is very necessary to get it in as soon as possible. Owing to the rock becoming much harder below No. 4 level, we will have to change our method of mining from hand to mostly machine work to obtain better results and reduce our operating expenses. My experience during the past year proves this conclusively. I am confident I can reduce our expenses from 15 to 20 per cent. with a suitable plant. I have looked into the matter considerably and would recommend that we put in a water power plant of 250 horse power capacity, which will furnish ample power to operate a compressor that will supply air for 10 drills, run a 75 ton concentrator, operate the hoist in No. 5 level, and furnish power for an electric light plant suitable for our requirements.

From estimates made we have from 75,000 to 100,000 tons of fillings in the mine and on the dumps, which in my opinion will pay handsomely to have concentrated. Have had some of the fillings tested at Kaslo Sampling Works, but will make a further test of about 1,000 tons, and results from such test will approximately prove their worth and satisfy us whether it will justify us in putting in a concentrator at the present time or not.

FINANCIAL STATEMENT.

ASSETS.

Mines, Mineral Claims and Assets	$2,607,004 92
Permanent Equipment	16,044 14
Office Furniture	556 74
Mine Supplies and Stores on hand, as per inventory	2,082 51
Accounts receivable	14,459 28
Cash on hand and in Banks	116,867 41
	$2,757,015 00

LIABILITIES.

Capital Stock	$3,000,000 00	
Less in Treasury	400,000 00	
		$2,600,000 00
Accounts payable		12,142 27
Profit and Loss		144,872 73
		$2,757,015 00

PROFIT AND LOSS.

To Cost of Mining and developing	$149,775 21	
" Freight and Treatment	209,225 05	
" Tools and Appliances, etc	2,102 54	
" General Expenses	3,817 52	
" Montreal Office Expenses	1,800 71	
" Ore tax	8,812 21	
" Written off Permanent Equipment	1,844 52	
" Repairs to buildings, Tramway, etc	1,159 53	
" Directors' Compensation	4,000 00	
		$382,537 29
" Dividends		234,000 00
" Balance		144,872 73
		$761,410 02
By Balance brought forward		$ 34,762 10
" Proceeds Ore Sales		717,056 07
" Miscellaneous Receipts		9,591 85
		$761,410 02

MOND NICKEL COMPANY, Ltd.

This company proposes to utilize the invention of Dr. Mond for refining nickel and copper ores. By his process a volatile compound is formed with carbonic oxide. He has protected the process by patents taken out in every country of industrial importance. An intimate knowledge of the details is required, it is said, for successful working, so that a practical protection is thereby afforded independently of patents. For the carrying out of the process, which is said to be an entirely new departure in metallurgy and likely to secure the command of the nickel trade, Dr. Mond has taken the precaution of securing some 22 mining locations, covering between four and five thousand acres, in the Sudbury District of Ontario, which at present produces nearly half the world's supply of nickel. On the locations a mine known as the Victoria Mine has been opened, and it is now in complete working order, and since February some 10,000 tons of ore have been raised, assaying 3½ per cent. of nickel and 3¼ per cent. of copper. Plant of the most modern type for roasting, smelting and Bessemerizing this ore has been erected there, and is practically ready to start. The matte so produced, and containing some 40 per cent of nickel and 40 per cent. of copper, it is proposed to transport to Clydach, near Swansea, in Wales, where extensive works, having a frontage to the Swansea Valley Canal, are in course of construction. It is calculated to produce some 1,000 to 1,500 tons of nickel and 4,000 to 6,000 tons of copper sulphate per year. The present consumption of nickel is about 9,000 tons a year, and is increasing rapidly. It is used in ship-building, especially for warships and armour plates, and for purposes where strength and comparative lightness are important, as in ordnance, rifle barrels, propeller shafts, locomotive axles, bicycles, etc. The process appears to have already been worked out in all details on a manufacturing scale and 50 tons of nickel manufactured and delivered to consumers. The sulphate of copper is obtained as a bye-product, and its use for the prevention of disease in the vine is considerable and increasing. It is estimated that the value of the sulphate of copper alone will cover the total expense of mining, smelting and refining the ore, leaving the value of the nickel as profit. If this is so, then substantial dividends should be shown, since nickel is quoted at £165 and sulphate of copper at £23 per ton. Dr. Mond, the vendor, takes a purchase price of £325,000. As to 50,000 in deferred shares, 99,165 in ordinary shares and the balance in cash. The amount is large, but seems reasonable, even moderate, since, with the exception of the £50,000 in deferred shares, it represents approximately the sum the vendor himself has expended in the business up to January 1st last. Since then he has expended a further £30,000, which the Company will refund to him. Of the 50,000 in deferred shares the vendor gives 10,000 to Dr. Carl Langer for his assistance in the past in working out the refining process. Dr. Langer becomes a director, and his services are secured for 10 years, together with all patents he may obtain in relation to the extraction of nickel. Dr. Mond, of Brunner, Mond and Co., becomes chairman of the directorate, which is undoubtedly a strong one, and ought to tell for success if any directorate should. Among its members we notice the name of Sir Andrew Noble, the chairman of Messrs. Armstrong, Whitworth and Co. After payment of the purchase price, £115,000 of the present issue of £472.496, part of a total nominal capital of £600,000, will be left to provide for the completion of the works, mining developments and working capital, and this sum is believed by the directorate to be amply sufficient. Those who can will secure an allotment in this Company.

Highlander.—This Ainsworth Camp property is being vigorously developed, the main tunnel being advanced at rate of 5 feet per day. The property has been thoroughly proven by diamond drill, with the result that three well defined galena ledges are known to exist, as well as a blind lead of chalcopyrite. The ore body first encountered averages 15 feet in width, with good values throughout. An upraise of about 1,000 feet will soon be started to connect main tunnel and surface.

NEW COMPANIES.

ONTARIO.

Massey Station Mining Co., Ltd.—Incorporated 24th April, 1901. Authorised capital, $300,000 in shares of $100.00 each. Head Office, Copper Cliff, Ont.

Algoma Steel Co., Ltd—Incorporated 10th May, 1901. Authorised capital, $20,000,000 in shares of $100.00 each. Head Office, Sault Ste. Marie, Ont.

BRITISH COLUMBIA.

Salmon River Gold Mining Co. of British Columbia.—Registered 25th April, 1901, as an Extra Provincial Co. Head Office for United States, Spokane, Washington. Head Office for British Columbia, John S. Clute, Jr., Barrister, Rossland, B.C. Authorised capital, $1,500,000 in $1 shares.

Rossland Proprietary & Mining Co., Ltd.—Registered under the laws of British Columbia, 25th April, 1901. Authorized capital, £10,000 in £1 shares. Head Office, Robert S. Lennie, Solicitor, Nelson, B.C.

St. Louis Mines, Ltd.—Incorporated 25th April, 1901. Authorised capital, $1,500,000.

Leech River Goldfields Mining & Development Company, Ltd.—Incorporated 26th April, 1901. Authorised capital, $12,000 in $10.00 shares.

Lynn Creek Copper Gold Company, Ltd.—Incorporated 11th April, 1901. Authorised capital, $30,000 in $50.00 shares.

Minnesota Mining & Development Co., Ltd.—Incorporated 14th May, 1901. Authorised capital, $1,000,000 in $1 shares. Formed to acquire and operate mines in the Lardeau District of British Columbia.

NEW BRUNSWICK.

Canadian Coal and Manganese Co., Ltd.—Incorporated 20th May, 1901. Authorised capital, $1,000,000 in shares of $100.00 each. Head Office, Coal Branch, New Brunswick.

GREAT BRITAIN.

Williams Concessions, Limited.—Registered on April 16th, by Ernest Salaman, Fort & Co., 12 Union Court, London, E.C,, with a capital of £5,000 in £1 shares (1,000 deferred). Object: To acquire and deal with mines, rights, land, milling, smelting, electrical, chemical and other works, etc., in Canada, British Columbia, or elsewhere, and to carry on the business of diamond, gold, silver, copper, coal, and general miners, smelters, metallurgists, engineers, contractors, etc. No initial public issue.

THE HELEN IRON MINE.

Dr. Robert Bell, Acting Director of the Geological Survey, gives some interesting particulars of the now famous Helen Iron Mine at Michipicoten being extensively worked by the Clergue Syndicate :—

The existence of iron ore at what is now the Helen Mine is said to have been known for two or three years to certain trappers and explorers, one of whom, Benjamin Boyer, brought it to the notice of Mr. H. F. Clergue in 1899. The latter purchased the location and immediately proceeded to develop it as a mine. The occurrence lies at the east end of a deep pond, about a quarter of a mile long, called Boyer Lake.

'The ore is a hard but somewhat porous or spongy red hæmatite, with a specific gravity of about 5. The ore-body, from which a layer of muck or peaty moss has been removed, forms a point dividing the head of the lake into two small bays. It has a lumpy surface with a dark blueish gray color. Small quantities of brown hæmatite (limonite) and yellow ochre appear in joints and cavities, but they do not form any appreciable portion of the mass.

'The horizontal dimensions of the exposed ore are about 500 feet in every direction and its greatest height above the lake is 100 feet. The ground rises steeply all around the head of the lake, so that the ore lies at the bottom of the amphitheatre, open to the west or lake side. A drift has been run at the level of the general surface of the ore, southward into the hill, and this penetrates similar hæmatite for 250 feet, thus giving a known breadth of 750 feet from north to south.* During the winter of 1899-1900, by taking advantage of the ice on the lake, a number of holes were bored in the bottom along a north and south line, which passed the extremity of the point of the ore at a distance of 250 feet to the westward. On this line and abreast of the point the lake had a depth of 100 feet, including ten feet of soft mud, and at 150 feet below the bottom, where the boring ceased, the drill was still in hæmatite like that on the dry land. A bore-hole from the surface of the exposed ore was sunk to a depth of 188 feet below the level of the lake without reaching the bottom of the hæmatite. The ore-mass has thus been proven to have a continuous depth of 300 feet. and as this follows the plane of the bedding, which is vertical, the probability is that the depth is very much greater. The general strike is parallel to the axis of the pond, which is about east and west. The railway approaches the mine from the west along the foot of the hill on the south side of the lake.

'The rocks rising steeply from the railway track a short distance west of the ore deposit and about in line with its southern side, consist of dark,

*Mr. E. V Clergue informs me that the distance from the head of this drift to the extremity of the ore point is 975 feet.

greenish-gray diorite and a soft, light-gray arkose schist. On the north side the ore-mass is bounded by a considerable thickness of thin layers of hæmatite, like that of the main body, interstratified with others of quartz rock. These alternating beds are from half an inch to three or four inches in thickness, and the mass is similar to the "jasper belt" traceable some miles to the east-north-east in the general strike of these rocks.

'The ground rises to a height of 440 feet, according to our barometer, at a distance of about 1,500 feet east of the mine. The hill is called Hæmatite Mountain, and the rock on its summit consists of light bluish-gray carbonate of iron (siderite), containing 36 per cent. of metallic iron, according to the analysis made in the laboratory of the Survey. Where it has been exposed to the surface influences it becomes encrusted with two or three inches of dark brown limonite, containing 52 per cent. of metallic iron. A light, yellowish-gray siderite, holding much finely divided silica, occurs near the northern side of the mine.

'Boyer Lake is about 1,500 feet in length. On the south side of its outlet there is a purer variety of siderite of the same color as the last mentioned, which also passes into dark brown limonite on the surface. The lake discharges by an artificial trench cut through a narrow ridge of rock, along a bed or vein of impure, finely granular light yellow iron pyrites. A width of about six feet of the pyrites is exposed. Similar pyrites in larger quantities occurs on the south side of Sayer Lake, which is about 25 feet below the level of Boyer Lake. In a railway cutting on the north side of the former lake there is a good fresh section of the unaltered rocks of the iron belt, in a zone corresponding to that of the hæmatite and quartz rock on the north side of the Helen Mine. They consist of thin alternating beds of siderite and chert. The former is mostly of a light yellowish color, while the latter is of all shades of gray from nearly white to nearly black. The alterations to which both rocks are subject everywhere in the district may be seen at this locality, the siderite passing into limonite and hæmatite and the chert into a fine-grained soft freestone or 'sugarstone.' Sayer Lake discharges over a ridge of rock into Moon Lake, which is 78 feet lower. Along the railway, from the outlet of Sayer Lake to within 50 chains of Moon Lake station the laminated rocks of the iron belt are well exposed in the cuttings. Here they have been thoroughly broken up and brecciated. The contrast in color of the two components, as shown on the recently exposed surfaces of the breccia, is soon increased by exposure to the weather, the siderite rapidly deepening in shade, while the chert, which is mostly light, shows out strongly in spots on the yellow and brown surfaces of the siderite.

'The great mass of hæmatite at the Helen Mine appears to have resulted from the alteration of an enlarged portion of the siderite band. Although the change occurred long after the upturning of the strata of which the siderite forms a part, it must have taken place at a somewhat remote period or long before the pre-glacial changes which produced the existing physical features of the region. The present surface of the ore-mass shows glacial striæ running S. 2° E. Some detached masses of the ore, driven from the bottom of valley now filled by the lake, have been elevated by glacial action and deposited on the slope and top of the hill along the southern side of Boyer Lake. As already stated, the general attitude of the bedding in the vicinity of Helen Mine is vertical, and the strike east and west, but immediately around the ore-mass some disturbance of the strata has taken place, and this may have been connected with the alteration of the large body of siderite.

'The boundaries of the ore-mass are not known with sufficient accuracy to enable us to make a correct estimate of the total quantity of ore which may be present at the Helen mine. But since any calculation may be better than none, the following can be given as a rough approximation, based on such facts as we have. The present exposed surface of ore measures, from north to south, about 500 feet, and the width is increased by 250 feet in the drift, or say 750 feet in all. From east to west the exposure of ore measures also about 500 feet and this length is increased by 250 feet westward from the extremity of the point by the record of the bore-holes, so that there is a known length of 750 feet. The report of the Ontario Bureau of Mines, dated 1900, gives the horizontal dimensions of the exposed surface of the ore-body as 650 by 850 feet. This would show a superficial area of 552,500 square feet, while the dimensions above stated would make it 562,500. The ascertained depth of the ore on the general plane of the bedding is 300 feet, namely 50 feet from the surface of the deposit to the level of the lake, 100 feet for the depth of the lake, and 150 feet in the bore-hole below the bottom. The breadth is as likely to expand as to contract in going down and we may safely assume that the walls descend about perpendicularly for the limited depth of 300 feet. If the deposit be supposed to be terminated by vertical planes at right angles to the strike, at the above distance apart, instead of allowing for its extension to a considerable length to the east and west, as would naturally occur in the case of an interstrafied bed such as this, the content of the mass which may be considered as proved to exist, (after allowing for the portion within the above measurements occupied by the water of the lake), would amount to about 26,000,000 tons of ore. Until the actual dimensions of the deposits are more accurately ascertained, it will be impossible to say what proportions the above measurements bear to the whole mass of ore actually present. Possible irregularities in the walls of the section here given may somewhat diminish or increase the above estimated tonnage, but any variation on this account from the above figure will probably not be large.

'Such a great mass of ore, having the form of this deposit, may naturally be expected to be continued in considerable force beyond the above stated limits, both as to depth and extension on the strike. It would not be surprising if the mine should produce more than double the above quantity of ore before it becomes exhausted. Three hundred feet, the depth to which it has been tested, is much less than we might reasonably expect a deposit of this magnitude and geological character to have, considering the fact that the strata are standing vertically. The occurrence of a considerable body of siderite on Hæmatite mountain, about 1,500 feet east of the mine and another at the outlet of Boyer lake about 1,500 feet west of it with the mine itself on the line of strike between the two localities, indicates the extension of the Hæmatite mass into the hill to the east and under the lake to the west.'

COMPANY NOTES.

Canada Consolidated.—This Company owns Lot 15, 5th Concession, Township of Jaffray, and Mining Locations K 157, S C 12, S C. 13 and S C 14, all in the Rainy River District, Ontario. Ample funds have been provided to ensure the steady and economical development of one or more of the properties. Satisfactory values have been obtained in past seasons, and the present management will proceed to thoroughly develop the veins known to exist.

Granite Gold.—This English Company, as noted in our issue of last month, is being liquidated, and is then to amalgamate with another English Company owning adjoining properties. At the shareholders' meeting May 6th it was explained that the Bank of Montreal and the Duncan Mines, Limited, had obtained judgments against the Company for £2,000 and £26,914, respectively. These judgments were obtained owing to threatened trouble with dissentient shareholders of the old Poor Man Company, whose property was acquired by the Granite Gold Mines, Limited. After liquidation and the proposed amalgamation have been accomplished, the properties will be worked to a larger extent than heretofore.

St. Keverne.—This Company has been reorganized with a capital of 100,000 $1 shares, assessable to 5c. each. Control is believed to be held in Montreal. Work will be resumed immediately. When the old Company ran out of funds it was understood that there was a very good showing of clean galena, and it is thought that now capital has now been found the Company will be a shipper before autumn.

Intercolonial Copper Company.—This Company informs us that it is now installing at its plant at Dorchester a battery of roasters built at the Phœnix Foundry and Locomotive Works of St. John, New Brunswick, under the Carmichael patents. These roasters are 15 in number, of a new type, and are expected to show a capacity of about 12 to 15 tons each every 24 hours. The power and sizing plant is complete, consisting of a Buchanan crusher, rolls, screens and elevators, furnished by the Geo. V. Cresson Company, of Philadelphia, and is all installed and ready for operation. This part of the plant will have a capacity of about 250 tons per day. The buildings, which will contain the leaching and electrolytic department of the mill, are complete, and the Holtzer-Cabot Company, of Brookline, Mass., is furnishing the dynamos, which will be delivered in six weeks according to contract. The Company hopes to have the entire mill ready for operation from July 1st to 15th.

Hall Mining and Smelting.—May 16. The limit of length of the first-class ore on the No. 6 level south is 45 feet, with an average width of 6 feet and an average assay value of 80 ounces per ton and 15 per cent. copper. —Office note. The manager is now raising and sinking on the vein to prove it in the levels above and below the No. 6 level.

Ymir Gold.—In enclosing the Warrant for the third Dividend of 1s. per share to the shareholders, the secretary adds:—I have much pleasure in informing you that the developments and the condition of the mine generally are extremely satisfactory, and good progress is being made with the long tunnel adit which has already reached a distance of 350 yards. This tunnel, it will be remembered, is being driven with the object of cutting the reef at the 1,000 feet level. At the recent meeting reference was made to the erection of a small plant for treating the tailings by means of cyanide. Information has just been received to the effect that very satisfactory results have been obtained, and although the complete figures could not then be given it is positively stated that the process is a financial success, and by this means, with an adequate plant in operation, the annual profits of the Company will therefore be largely increased.

Bosun Mines.—The Secretary reports to the shareholders, under date of 15th instant, having met with a rich ore chute in the lowest, or No. 1 Tunnel:—NEW DENVER, B.C., 25th April, 1901.—"*No. 1 Tunnel.*—You will be pleased to hear we have cut into some rich Ore on the footwall of the lode in this tunnel, at a point about 720 feet from the entrance. The lode has opened out suddenly, so that we have neither walls, but we are cross-cutting for the footwall, as we have found the ore in the bottom of the tunnel and it appears to lie on this wall and run up away from us rather flat. The paystreak seems to be 7 inches wide, and is solid Galena, of that lustrous, fine steely character, and assays from a rough sample not at all selected, Silver 112.5 ozs., and Lead 76.7 per cent. per ton. I am sure this will please you, as it does me, showing as it does that our plans are right, and that the ore chutes hold down and retain their values. I cannot tell you much about it for a few days, for we have floods of water and the cross-cutting must be done. We are still a few feet from the spot where we expected this ore, which I believe to be the first chute shown on the plan above No. 2 Tunnel." Also the following telegram dated New Denver, 14th instant:—"*No 1 Tunnel.*—The lode in face of drive is well defined and of a promising nature, carrying ore 7 inches wide of good quality. We have had constant trouble with water. Mine looking up all round."

Tyee Copper Company.—By mail dated 11th April, the following information has been received and sent to the shareholders:—Main Shaft: This has been sunk to a depth of 100 feet from the surface, the progress of sinking being slower than was anticipated, on account of the hard material (diorite) through which the shaft is being sunk. North Cross-cut No. 1: This is being carried further north, and is going through the same kind of formation as in the adjoining claim (the "Lenora"), where a rich parallel vein has been struck to the north. N.B.—A cable has just been received from Mr. Livingston, stating that the parallel vein expected to be met in our Cross-cut No. 1 North has been struck, 3 feet wide, and contains high class ore, samples of which have been sent to London. West Drive: This is a new drive which has been started on the 200 feet Level to extend our operations up to the western boundary. This is progressing well, and is being driven in ore. Assays from Upraise in Cross-cut No. 4 give copper 7.2 per cent., gold $1.20, silver $1.17. At 28 feet up an improvement took place in the ore in this upraise, an average sample assaying copper 14.6 per cent., gold $6.40, and silver $3.45. Consulting Engineer: Mr. W. Pellew-

Harvey, who was formerly Consulting Engineer to this Company has resigned his position, having accepted an appointment under the Canadian Government to take charge of the new Assay Office, which is being opened in Vancouver. Mr. Harvey continues to do the Company's assay work. Mr. William Thompson, 58 New Broad Street, London, who is acquainted with the property, has been appointed by the Board as Consulting Engineer to the Company, and is now on his way home after inspecting the property.

Queen Bess.—Cable from the mine: "Last month 200 tons mined; net value is estimated at $4,900; estimated expenditure, $4,175."

Rossland Great Western.—The following figures are reported:—"Returns from ore shipped during developments to date, namely, 3,461 tons, yielding 1,701 ozs. gold, 2,706 ozs. silver, 54 tons copper; value £11,138."

Le Roi No. 2.—The following figures are to hand:—"Returns from ore shipped during developments to 31st March, namely, 8,592 tons, yielding 4,390 ozs. gold, 15,778 ozs. silver, 206 tons copper; value £34,262. Return for month of April, 4,469 tons, yielding 1,798 ozs. gold, 6,389 ozs. silver, 98 tons copper; value £14,934."

Granite Gold.—An extraordinary general meeting of the shareholders of the Granite Gold Mines, Limited, was held in London, this month, for the purpose of considering and, if thought fit, passing the following resolutions, namely:—1. "That it has been proved to the satisfaction of the company that the company cannot, by reason of its liabilities, continue its business, and that it is advisable to wind up the same, and accordingly that the company be wound up voluntarily." 2. "That Mr. William McEwen, of Monument Square Chambers, London, E.C., chartered accountant, be, and is hereby appointed liquidator for the purposes of such winding up." Mr. Alex. McNab (Chairman of the company), who presided, moved the first resolution. Mr. Mitchell seconded the motion, which was carried unanimously, without discussion. Mr. I. Gluckstein said that he believed Mr. Roy Meldrum was willing to undertake the liquidation of the company. He, therefore, proposed: "That Mr. Roy Meldrum, of 5 and 6, Great Winchester Street, be and is hereby appointed liquidator for the purposes of such winding up." Captain Bax seconded the resolution, which was agreed to.

The Gold Gravels of the Stewart River.

The Stewart River bars were found to be auriferous as early as 1885, and in that and the two succeeding years it is estimated the yield amounted to about $100,000. Prospecting has been carried on to some extent ever since, but the production has been small. Bars have been worked from the Mayo forks down almost to the mouth of the river. Steamboat bar, the richest bar discovered on the river, is situated about four miles below the McQuesten, and is reported to have yielded for some time at the rate of $140 per day per man, as worked with a rocker. The gravels on this bar were auriferous to a depth of somewhat over two feet. In most of the other bars which were worked the auriferous deposits was less than a foot in thickness, and was confined to a small area near the head of each bar. The extreme shallowness of the gold-bearing gravels accounts for the rapid exhaustion of the Stewart River diggings. During the past season no work of any kind was being done on the main stream below the Frazer falls. On the tributaries, some work was done on Scroggie Creek, on some creeks near the head of McQuesten, where some gold was taken out, and, late in the season, a strike was reported on Clear Creek.

The gold on the Stewart River bars is fine, and there is every reason to believe that it has been concentrated from the high gravel and sand banks described above as occurring along the valley from the Mayo down to the McQuesten. The gravels nearly everywhere contain scattered colors, and they are constantly being undermined and carried away by the river. During the past season a prospecting party under Mr. Morley Ogilvie examined the lower part of the river for dredging purposes, and the results are reported to be very favorable. The gold in the bed of the river proved to be coarser than on the bars, and was found in encouraging quantities. The conditions on the river are favorable for dredging, as the current, except in a few places, is not swift, and the gravel is comparatively small, with few large boulders.

LEGAL.

DEZIEL *vs.* BLACKBURN—JUDGMENT OF THE COURT OF KING'S BENCH.

D. was employed to work in a mica mine. While working in the lower level of the mine he was injured by a rock which fell from the wall of the upper level, bringing down with it a platform which was then being built. D's left leg was broken, and he was permanently injured, only being able to do light work while seated. He sued his employers for damages, on the ground that the accident was caused by the negligence and want of care of his employers and their foreman.

The evidence showed that stones and rocks had been falling from the roof to the danger of the men working on the lower levels; that a certain large rock was loose and threatened to fall, and that the foreman was notified of and admitted this danger; that after a considerable delay the foreman began to have a platform built to intercept this and other rocks, and that before it was finished the rock fell. It was also shown that on this very day D. had been directed to shovel some loose stones at a place immediately below the loose rock and the platform, and had been told that everything had been fixed and that there was then no danger.

The court decided that this evidence showed that the foreman had been very imprudent in thus telling D. to work, or even in allowing him to work at such a dangerous point, and that the employers were responsible to D. for the result of their foreman's negligence.

The employers also contended that the accident was one which was incident to the nature of the work in which D was engaged, and that as he had voluntarily undertaken the work they were not liable for the injuries he had sustained. The court held, however, that that would only be so when the accident was one which could not have been foreseen, and when the employers had not been negligent, as they were in this case.

D. was given $1,400 damages, and this judgment was confirmed by the higher court to which the employers appealed.

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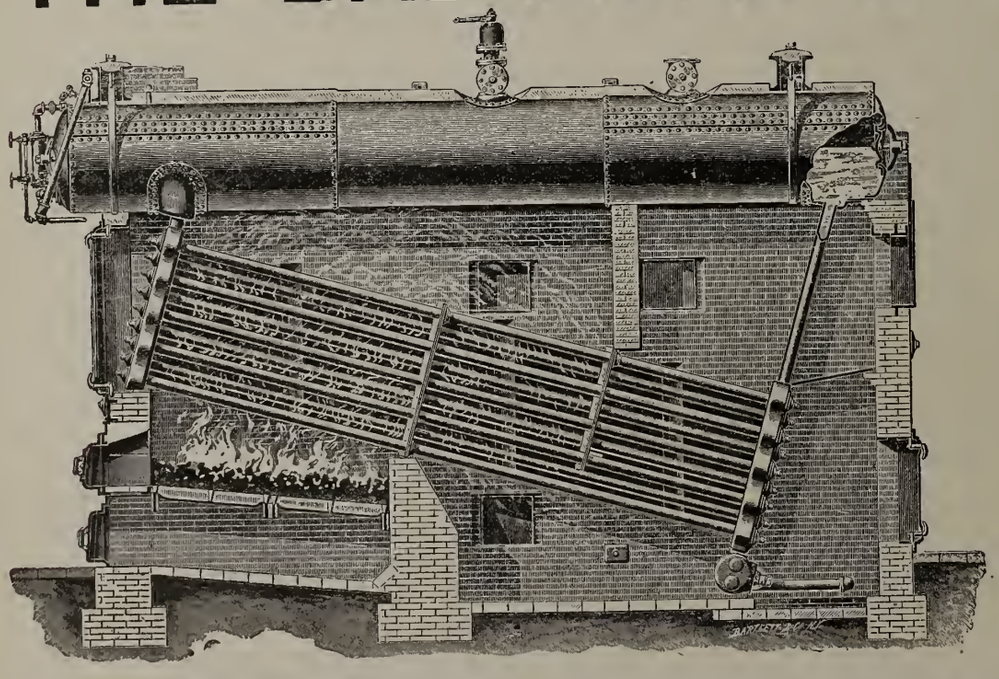

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MINING SAFETY LAMPS.—At a recent meeting of the Institution of Electrical Engineers, Mr. Walker, who read a paper on mining lamps, mentioned that the Su-smann gas-detecting apparatus is based on the occlusion of hydrogen by spongy platinum, but another means adopted is the diffusion of gasses. There are three well known means of securing lamps against interference: first, a set screw; second, a lead rivet; and third, the magnetic lock; but all of these could be tampered with, and if an ordinary lamp were opened, the consequences might be disastrous. The electric lamp puts a miner in the position of a man who has no matches in his pocket, and, therefore, cannot strike a light. As carbonic oxide is always present after an explosion caused by the igniting of the coal dust lying about a mine, it appears that a detecting apparatus showing the presence of this gas may be of immense use. If a miner can carry a battery strapped around his waist, the problem is solved, and an efficient lamp can be provided at once.

AN IMPROVED WINDING CAGE.—In a buffered winding cage, designed by Theodore Bierbusse, of Kray, Essen-an-der-Ruhr, besides the usual fixed decks for receiving men or tubs, there is a special frame fitted to the undersides of the floor, but capable of a slight travel in the direction of the lift, and having springs or some elastic substance intercalated between the floor and the frame. On the cage being set down on the keps, the frame takes the shock and is arrested, while, owing to the momentum, the cage continues to descend until the *vis viva* is absorbed.

PIG IRON PRODUCTION IN CANADA.—The statistics relating to the production of pig iron in the Dominion of Canada in 1900, as ascertained from the manufacturers by the American Iron and Steel Association, have just been issued. It appears that the total output for the year named was 86,000 gross tons, as compared with 94,077 tons in 1899; 68,755 tons in 1898; 53,796 tons in 1897; 60,030 tons in 1896; 37,829 tons in 1895; and 44,791 tons in 1894; beyond which year the statistics of the Association do not go. Of the production of last year 70,349 tons were made with coke, and 15,741 tons with charcoal. The total output includes 3,781 tons of Bessemer pig iron. Neither spiegel nor ferro-manganese was made during the year under notice.

CORUNDUM, OR EMERY.—Corundum is one of the economic minera's to which the attention of the prospector and miner should be drawn, as the demand for it is increasing and is certain to continue. Mineralogically it is the oxide of the metal aluminium, and when pure contains 53 per cent. of the latter and is its richest known ore. It is generally a grey or bluish grey substance, but it is often coloured brown, black, yellow, or even red, with impurities. It may occur in granular massive form, but usually it is crystalline in structure, and the crystals when closely examined are six-sided prisms whose length is greater than their thickness. The main axis of the crystal is also inclined with respect to the other two, giving rise to forms which ore called rhombs. These crystals, and also any solid portion of a grainy mass, are very hard, and will easily scratch the face of a quartz crystal, and in fact almost any substance but the diamond. The weight is between that of zinc blende and metallic iron When pure, corundum is really a gem. If of a distinctly blue tint it is the sapphire; when violet, the amethyst; when golden yellow, the topaz; when green, the emerald; when red, the ruby. These colours are due to a slight quantity of different metallic oxides. When the mineral is in fine grains, and of a dull brown or black colour, it is known as emery.

Extensive deposits exist in the Province of Ontario, Canada, and are being opened and worked. Here the mineral occurs in the near vicinity of eruptive rocks, and it may be generally stated that although granite rocks of the grey and micaceous order seem to be the natural home of corundum, yet there is generally, if not always, in the vicinity of the deposits, dykes or overflows of trachytes, basalts or trap rocks.

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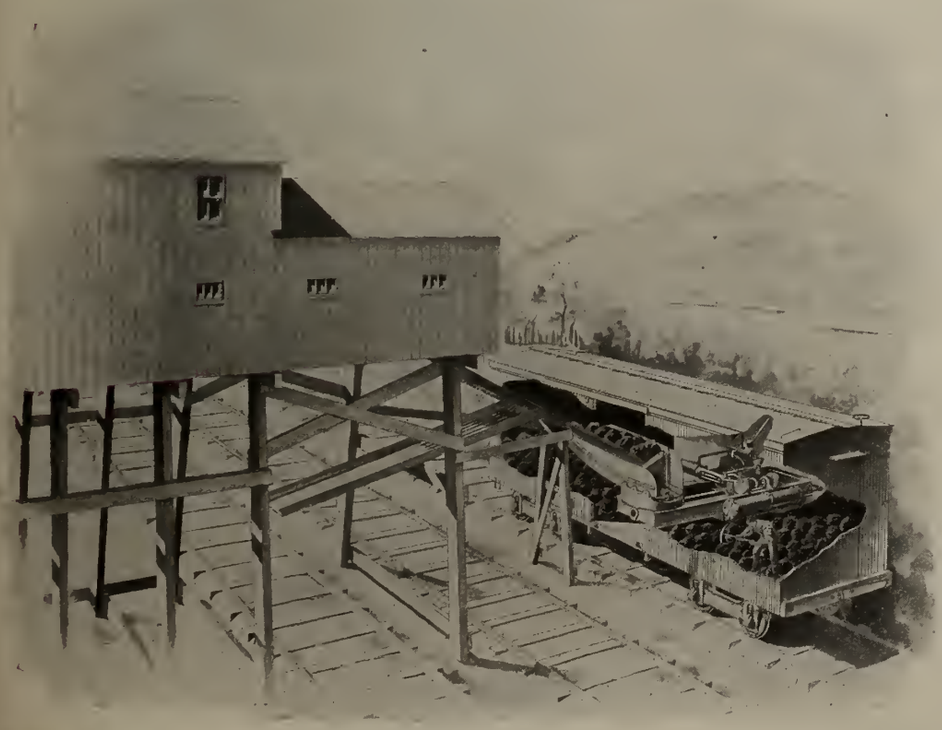

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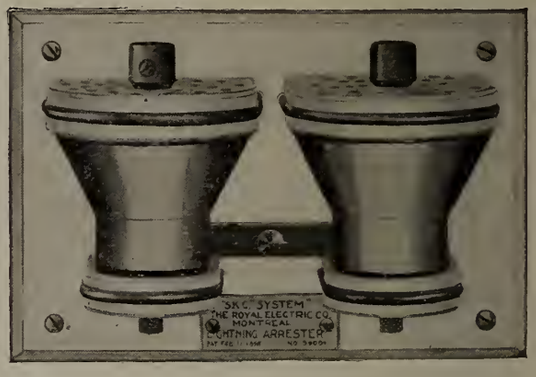

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Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite: copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

HONORABLE E. J. DAVIS,
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The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals*; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
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GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,
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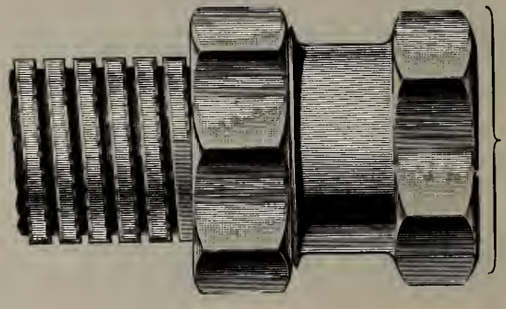

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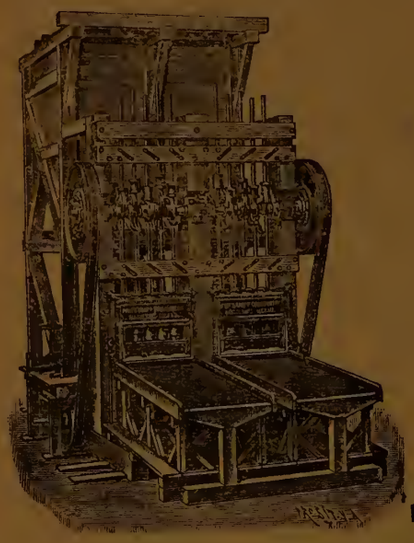

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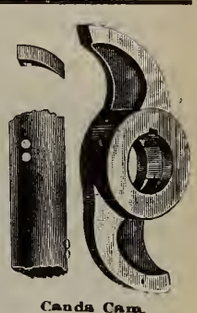

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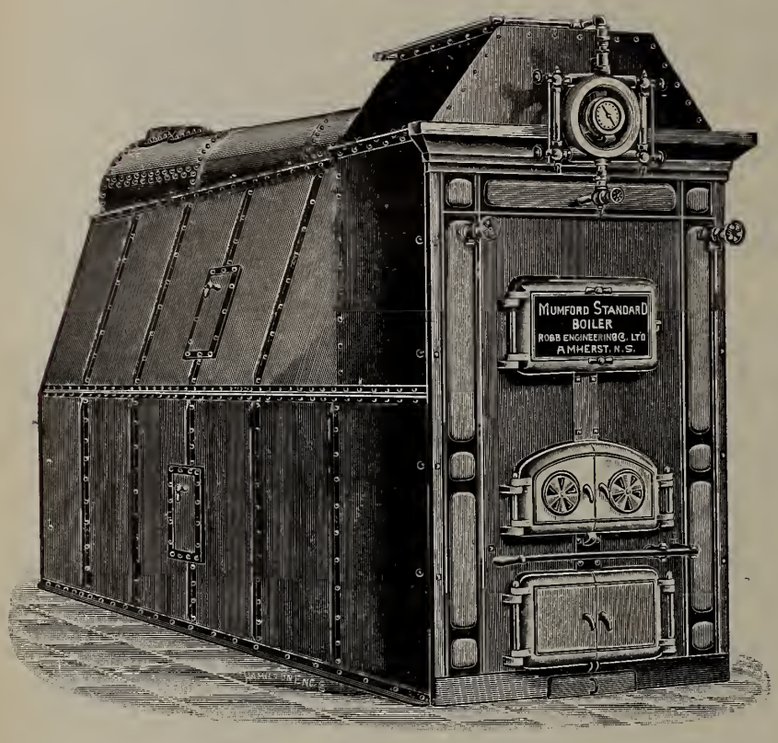

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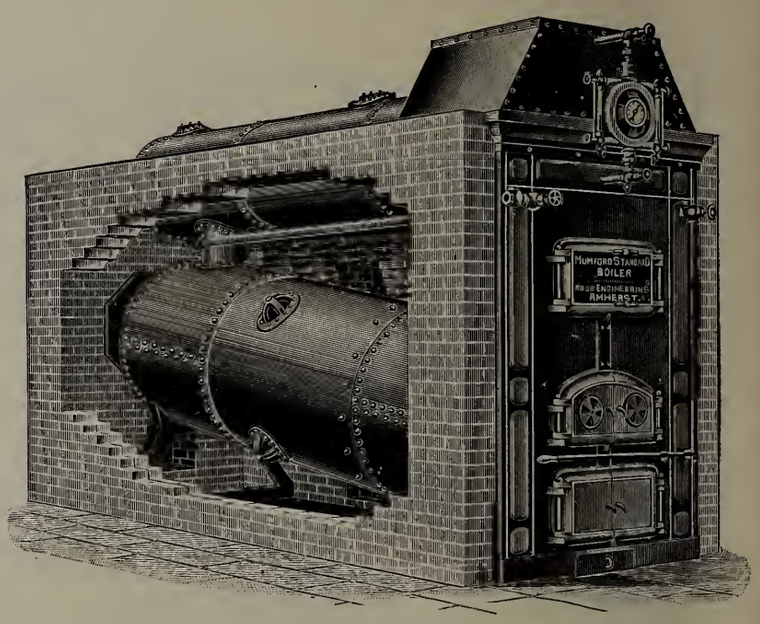

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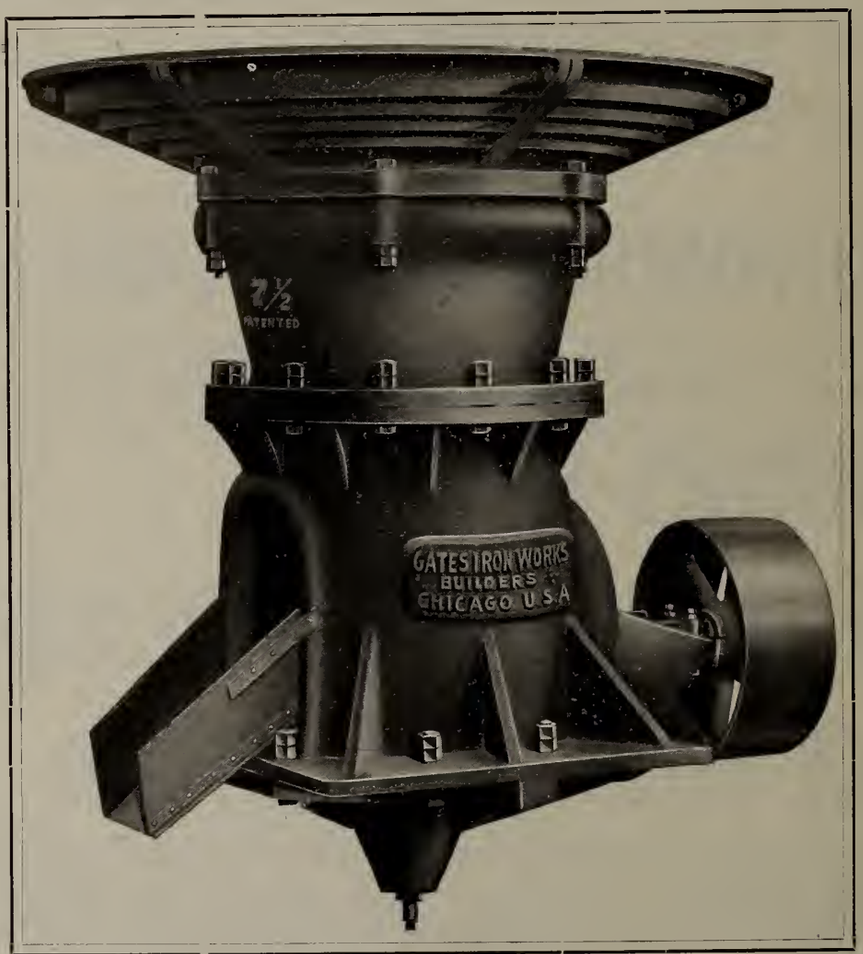

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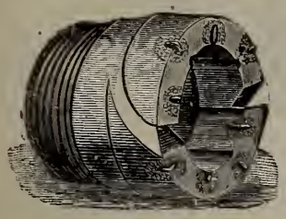

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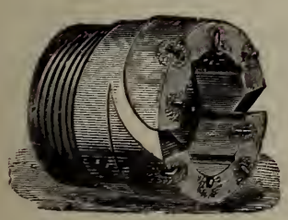

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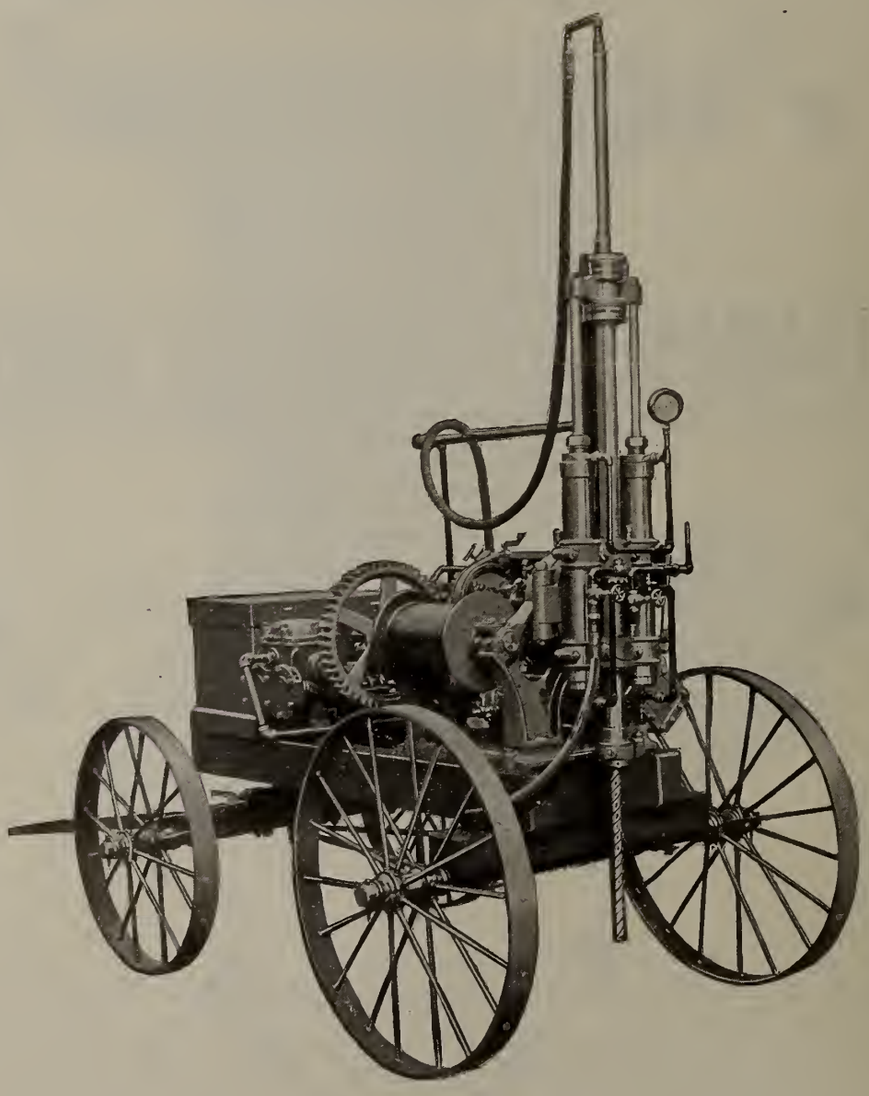

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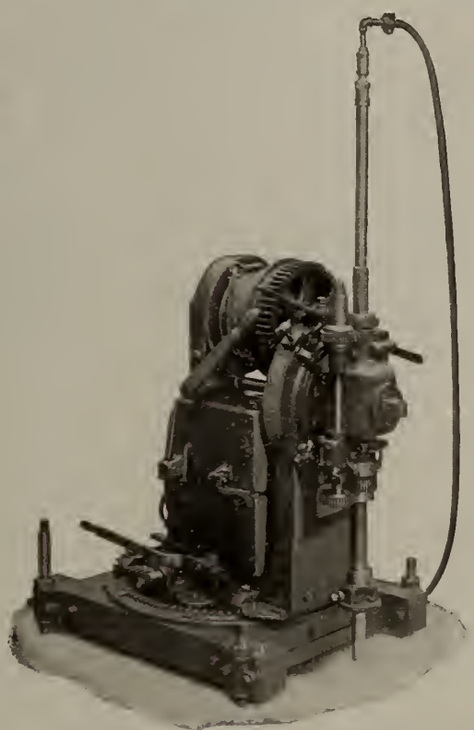

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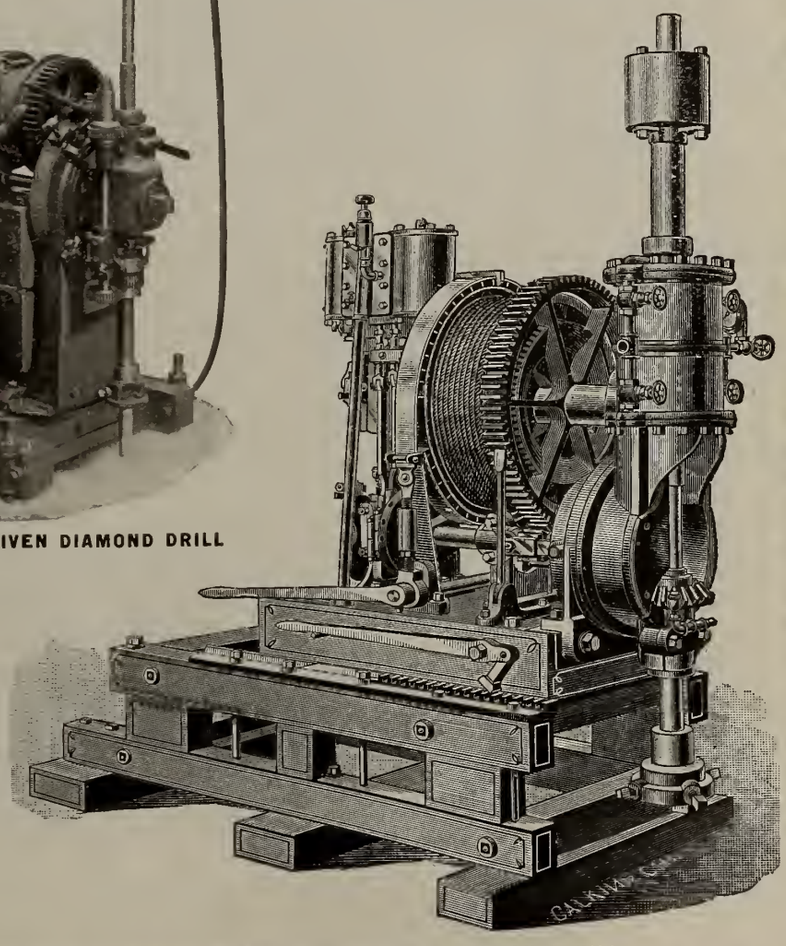

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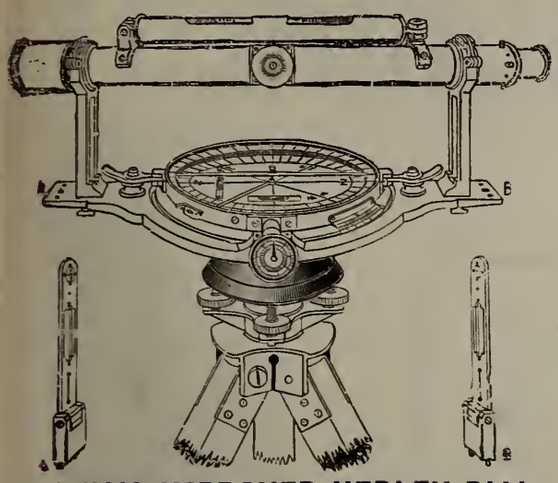

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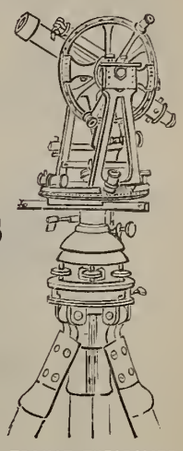

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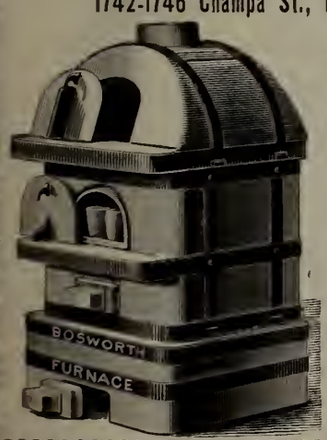

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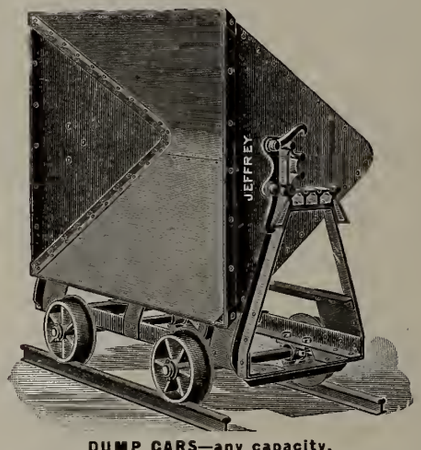

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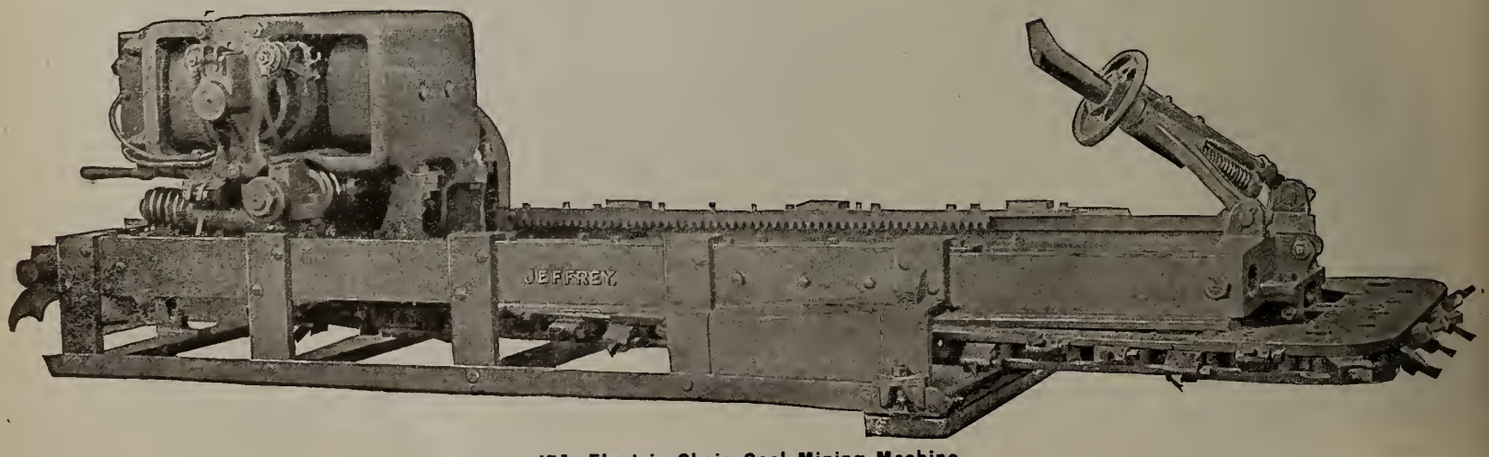

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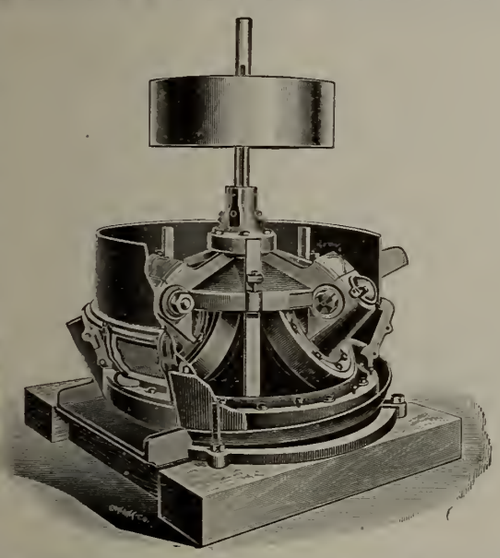

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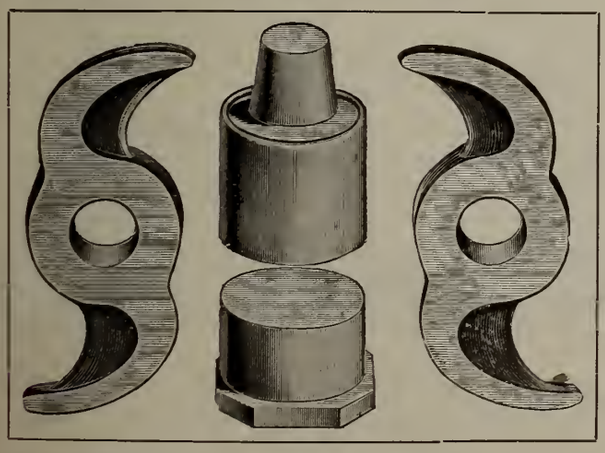

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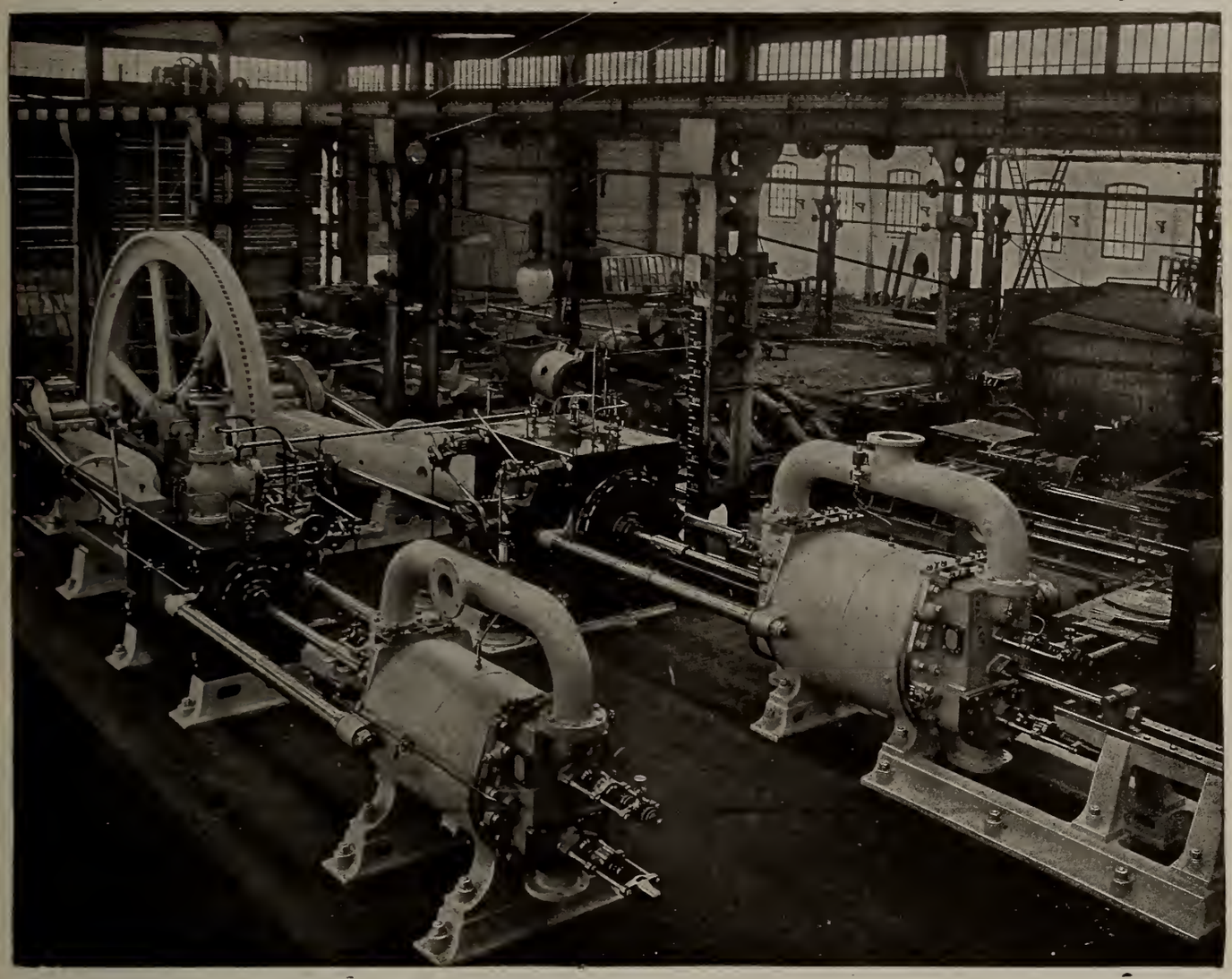

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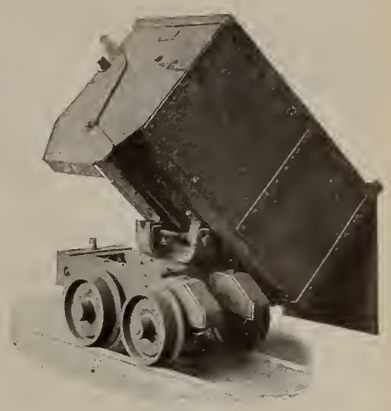

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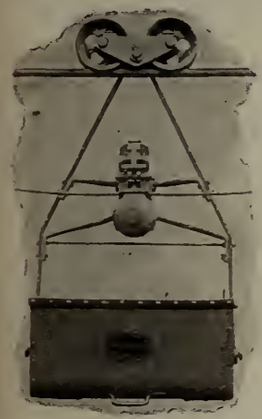

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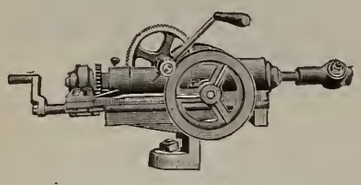

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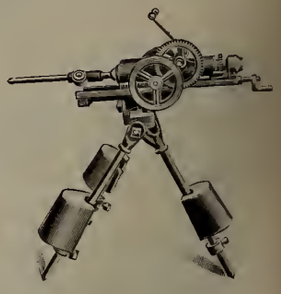

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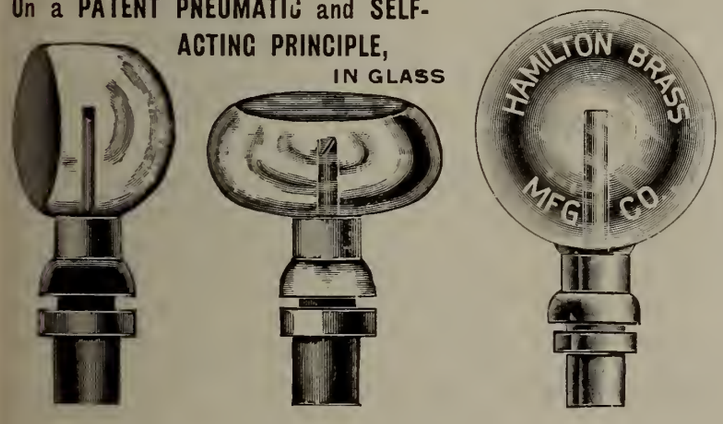

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Rat Portage, Ont.

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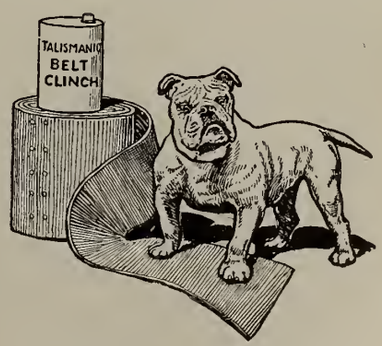

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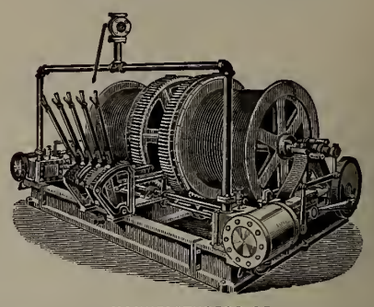

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Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

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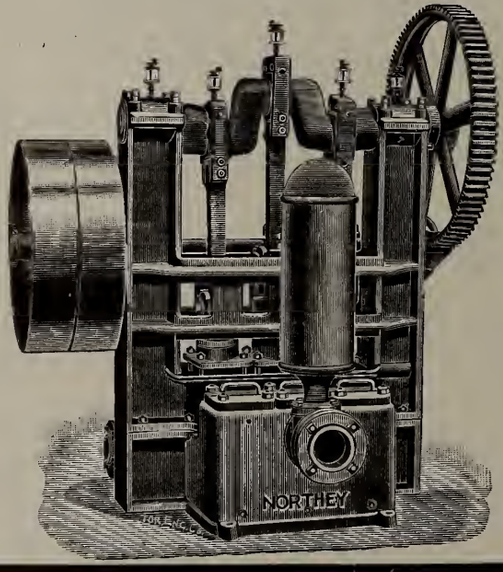
Triplex Power Pump . . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

THE NORTHEY CO., Limited, Toronto, Ont.

19th YEAR OF PUBLICATION.

The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 6. JUNE, 1901. VOL. XX., No. 6.

Company Law Reform and Mining Stock Exchanges.

They who would see the investment of capital in mining enterprise placed on an honest basis are brought face to face on the one hand with the indisputable fact that the modern Joint Stock Company, without personal liability, with duly licensed capitalization, and with power to issue stock at any fraction of par, is an institution which is inherently rather adopted to purposes of swindling than to promote legitimate investment in industrial enterprise; and on the other hand must face the facts, that the charter mills of several American States will supply any Joint Stock Company with authority to issue stock regardless of any limitation whatever, and that the Canadian Provinces, for the sake of international comity, license any such corporato hold land and issue stock. It is urged that our Provincial Governments should not be outdone by any foreign state in the sale of licenses to raise money by any of the means known to company promoters; that such licenses are a proper source of revenue, and that practically the provinces should not neglect the interests of their treasuries from any squeamish care for the morals or the pockets of the community when such noble examples as the States of New Jersey, Delaware and West Virginia will sell, for a consideration, to any three or more, persons an unlimited charter of incorporation, valid in any quarter of the civilized world, subject to merely such local license as may be required in this or any country alien to the State granting the charter, and which license cannot on the ground of comity be denied if the applicants will pay a reasonable fee, which is customarily not greater than that levied for the grant of a charter. The answer to every objection raised to the grant of such a franchises is that the purchaser of mining company shares is not entitled to any special protection, and that all that the law undertakes is to register the name and head office and officials of the company upon which it has conferred the status of a corporate name and entity. Beyond this, say the free traders in charters, every buyer of stock should look into the character of the investment offered. If he invests, as in nine cases out of ten he does, on his confidence in the names which compose the directorate, he will in eight cases out of ten find that the directorate have had judgment less than his own, having themselves invested upon grossly insufficient information of the worth of the property, or with uttermost incapacity for wisely directing the expenditure of capital in the enterprise. The personal element upon which so many women and clergymen have banked when taking shares in mining companies is too frequently the element of least worth to guide to the valuation of an investment Many philosophers have wisely pointed out that defect in human nature which imparts an artificial weight to the opinions and dispositions of our friends, predisposing us to accept them idly and dispense with the rational tests which they require, or even to suppress incipient doults of their correctness and uphold them without clear assurance of their truth. We have in fact more to learn from our enemies than our friends. While it may be a fairly good reason for taking shares in a life insurance company or bank, that the ex-premier of a certain province with a fair reputation as a sound business man is at the head of either concern, it is quite possible that at the same time he may be utterly incapable of a reasonable judgment of the value of a mine. Were this axiom as widely known as it should be, there would be less bad investments in mining stocks to complain of. It is evident that a large share of the disastrous investments of the last three years are chargeable to the gratuitous assumption on the part of company directorates that they were qualified for their position. Malebranche sagely remarks that "the man ambitious of social or political eminence is surrounded by admirers and partizans who fill him with the idea that he knows all that is worth knowing, and habituate him to look down upon intellectual superiors of more modest station; and he is dependent on the suffrage of others who know and think even less than himself and whose ignorant humors he must consult. Enveloped in these influences, he lives and breathes in an atmosphere of illusion."

At the outset let it bc set down before all else that honesty in the promotion of any mining adventure requires proof of the existence of a mine. The public in the majority of cases dispense with this proof and gamble on a few samples and the certificate of an assayer. The stock-in-trade of the average promoter is not the value of the property, but the credulity of people with money in their pockets. One reads in any book of political economy that the transfer of this money from one class of the community to another does not necessarily represent a loss, and is not of itself an unmixed evil. The befooled buyer of mining stocks will draw the wise conclusion that political economists are not necessarily more moral than company promoters, and that in the presence of either he will do well to heed the legal maxim, "caveat emptor," which, being interpreted, is "beware of pick-pockets."

Having sized up the incapable directorates who flourish occasionally in the fertile soil of an ignorant, credulous community, it remains to discuss the class by whom they are brought into affinity or mutual relation, the stock brokers. There is not room for the least doubt that honest stock exchanges in Montreal and Toronto could effectually, to the advantage of their members, promote investment in mining enterprises and discourage the formation of ill-considered or dishonest schemes. Why they do not take this course, frought with the very best results to the community and their members, baffles inquiry. The

organization of stock exchanges in Montreal and Toronto having a code of rules that would exclude from the list of stocks for sale on change every adventure not vouched for by a competent investigating committee, aided by an engineer of the highest technical skill, would afford the public reasonable guarantees of the security of their investments in mining shares. The only reason why this plan is not adopted would appear to be that the commissions might be for a time less numerous. The opportunities for rigging the market would be fewer under a system which would ensure careful iuvestigation of the merits of a property before listing the stock of its corporate owners. The position of the Canadian stock broker under the present system could not be well worse than it is. Those of them who have brought out mining companies are heartily sick of the business. The paper in the *Monthly Review* for May on "Investment, Trade and Gambling" will afford some of these gentry food for reflection. The writer commends well-chosen, adventurous investments as more fertile and nationally beneficial than the purely speculative or than those which may be called securities. "The doctrine must be preached that the adventurous investment is the truly patriotic form of using capital; that in the creation of new industries and new ventures lies the hope of the nation; that he is not a gambler who accepts his risk in an investment like a man and abides by it, fairly making his choice; but that every member of the investing public who yields to the stock jobbing ideal of seizing a turn on the market with the "Devil take the hindmost" notion in his mind is doing what he can to sap our (Great Britain's) national pre-eminence and undermine the commercial integrity upon which as a nation and empire we depend."

London has its "open sore" in the facilities for swindling under the Imperial Joint Stock Company Act. Numerous are the amendments proposed as remedies. The writer in the "Nineteenth Century" for April would abolish the liability of the directors for matters in a prospectus whereby a shareholder has been deceived. He contends that such matters are properly chargeable to the promoters with whom the ignorant directors who issue the prospectus have no relation, and that the result is that practical honest men are shut out from a sphere of usefulness as directors and incompetents fill the places which would otherwise be occupied by capable men. It would be difficult, as some of our mining company affairs are now managed, to convince many that there is no guilty relationship between promoters and provisional directors. In fact Mr. Hooley, who still appears to flourish defiance in the face of creditors and to enjoy the good things of life with much splendor thrown in, would tell us that between the promoter and the provisional director there is a relationship which costs the former in proportion to the title and social rank of the latter.

Would the amendment of the law, which as it stands is some check upon the purchase of titled directors, lead promoters to seek a less distinguished but more capable class to give their names as provisional directors of mining or other companies? It may be doubted; for the reason that the share-subscribing community would not as a rule purchase shares quite so readily under other than the present system. It is a comfort to so many to know that if they are swindled they are in the same boat with the owner of a title. Company law reform will make progress only by some means of sharply distinguishing between stocks which are purely speculative and without character and those which, with proper safeguards, are issued for the aid of legitimate enterprise. For the latter people might go to the stock brokers, for the former they would seek the dealers on the curb-stone and promoters. The lines of separation would be speedily known. A listed stock would have character as a legitimate mining proposition, having a sufficient fund for development, competent miners and managers, and a reasonable prospect of dividends in sight. An unlisted stock might be brought out with a large acreage, a few samples, a glittering assay, and those prospects of large returns which are realized in one case among one hundred and ninety-nine failures. The gamblers for the off-chance will naturally seek such "solid and inexpansive" investments at the hands of the unctuous and persuasive vendors

But while the rare good work of winnowing the wheat from the chaff might thus go on, may any reasonable hope be indulged that sound mining investments will, in the Province of Ontario, occupy a fair share of public attention at home and the favor of foreigh capitalists while there looms in the distance the possibility of provincial taxation indicated by the legislation of last session.

Dawson & Selwyn Memorial Portraits.

In recognition of the invaluable services rendered towards the development of the mineral wealth of Canada by the late Dr. George M. Dawson and his predecessor, Dr. A. R. C. Selwyn, late Directors of the Geological and Natural History Survey of Canada, the Canadian Mining Institute invites subscriptions from the Canadian mining public towards its fund for the purpose of presenting suitable portrait paintings of the late Directors to the Museum of the Survey with which their life work has been so prominently identified. Remittances marked "Dawson and Selwyn Memorial Portraits" should be sent to the Treasurer of the Canadian Mining Institute, Mr. J. Stevenson Brown, Temple Building, Montreal, or to the undersigned. All subscriptions will be acknowledged in these columns. The following amounts have been subscribed to date:—

B. T. A. BELL,
Secretary.

Lord Strathcona	$150.00
Canadian Mining Institute	100.00
Officers of the Geological Survey	54.00
Hon. Sydney Fisher, M.P., Ottawa	25.00
London & B. C. Gold Fields, Ltd, Nelson, B.C.	25.00
Canadian Mining Review, Ottawa	25.00
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Sultana Mine of Canada.—Mine manager's report for the week ended May 25th:—Stoping ore in progress in south workings, also below the floor of No. 4 level south. The average assay value of the ore broken, and sent to the mill, during the week is $5.13 gold per ton. Mill tailings, $1.03 gold per ton. The diamond drill work during the week resulted as follows:—No. 1 bore hole—South-westerly from No. 4 level south heading. Depth of hole, 50.5 ft., penetrating vein matter and porphyry. No. 2 bore hole—Westerly from No. 4 level south heading. Depth of hole, 40 ft., penetrating quartz stringers, vein matter and porphyry.

CORRESPONDENCE.

Superintendent of Mines for Canada.

To the Editor:

SIR,—To you, as one wide awake and having an all-round eye on events as they are marshalled out, I, for one, turn for information.

The item that I am in want of to-day relates to the recent appointment by the Federal Government to the office of Superintendent of Mines for Canada. I assume that others like myself, engrossed in details of mining operations and long governed by local statutes enforced by Provincial Inspectors of Mines, are unfamiliar with the object, authority and duties of such an officer. Can you tell us of the statute under which the appointment is made, our liability, if any, in the matter of regulations and statistical returns, and then if the appointment has a practical bearing, with a mind disposed towards the preservation of life and property, wherein has a career spent in university teaching found that experienced believed essential to the correction and instruction of men practiced in the art, for it is an art, of following up veins, beds, pockets, shewings of ore, excavating with economy and protecting the resulting works at a minimun of cost? But if this appointment means no confliction with provincial laws and duties, and relates merely to Federal interests in the Yukon, why are we overshadowed by so comprehensive a title and our overwrought nerves thereby worried unnecessarily?

NOVA SCOTIAN MINER.

The appointment to which our correspondent refers is that recently vacated by Mr. Wm. Pierce, D.L.S., of Calgary, and appertains to lands in the North-West and British Columbia known as Dominion Lands, under control of the Department of the Interior. The following letter received from the Secretary of the Department explains itself:—"I am directed to acknowledge the receipt of your letter of the 18th instant, addressed to the Minister of the Interior. In reply I am to state, in answer to these enquiries, that the office of the Superintendent of Mines was created by Section 6 of Chapter 54 of the Revised Statutes of Canada, under which the Governor-in-Council has power to appoint an officer who is styled "The Superintendent of Mines;" and such officer is declared to have the powers and perform the duties that are from time to time prescribed by the Governor-in-Council. It is not considered that the statutory title of the officer in question need necessarily have any disturbing effect upon the community. Being an appointee of the Federal Government, his duties are of a federal and not of a provincial character, and will appertain to the promotion of the mining industries of Canada. It is believed that the appointment recently made will prove highly beneficial to the country as a whole.

There is at present no liability on the part of mine owners, where the public lands in which they are operating are owned by the provincial government, to make statistical returns to the federal government. The mining regulations passed by the federal authority do not apply to mine owners so engaged, or interfere in any way with local statutes.

I have the honour to be,
Sir,
Your obedient servant,
P. G. KEYES,
Secretary.

The Virginia Mining Co. of Ontario.

SIR,

I have felt inclined on several occasions to call your attention to the rather reckless statements of your Rat Portage correspondent in reference to Lake of the Woods properties in general, and the Virginia in particular, but have always refrained from doing so.

In your issue of May 31st he surpasses himself, and in three lines makes more false insinuations about the Virginia than is generally allowed. I well understand the animus of the statements—that is another story, and a personal matter—but as the general public is unaware of this, his statements might prove misleading to some and I therefore hope, that as a just and fair minded journal you will allow me space to reply.

1. There is no deal pending on the Virgiuia that I know of.

2. We have not expended $40,000 on the property as our books would easily show.

3. If your correspondent will duplicate the work done at the Virginia for $10,000 we will give him steady employment at a higher salary than he is able to make in his present calling.

Your correspondent probably thinks that because I personally built a fine house at the mine and furnished it, that this was done at the expense of the company and he probably estimates quite a snug figure for that house, which is unfair to both the company and myself.

I know personally that he never saw the mine workings. During my absence they were flooded and before that he was expressly prohibited, hence his statements are mere gossip, the only true thing being that the Virginia does deserve a chance.

Pardon my taking so much space; we are a close corporation, not seeking notoriety and are sorry that it is necessary to answer such idle rumours.

Yours truly,
S. H. BROCKUNIER.

Wheeling, West Va., 4th June, 1901.

Copper Smelting in British Columbia.—A Review of the Operations of the Granby Smelter and Proposed Improvements.

By A. B. W. HODGES, Grand Forks, B.C.

The plant and water power were about finished in August, 1900, and the first furnace was "blown in" during the latter part of that month; the other furnace was not blown in until October of the same year, when sufficient coke supply was on hand. Since that time both furnaces have been in continuous operation, No. 1 having run 10 months and No. 2 8 months without either being "blown out."

From the time of starting up to June 1st we have smelted a total of 162,000 tons of ore, which is a very fair record for a new property.

The two furnaces are 44 x 160 inches at the tuyeres, and 14 feet high from furnace floor to feed floor, and are double water jacketed and continuous slag flow, and were built for a nominal capacity of 250 tons each per 24 hours, but they have put through an average of over 300 tons per 24 hours, making a total smelting capacity of from 610 to 640 tons per day of 24 hours.

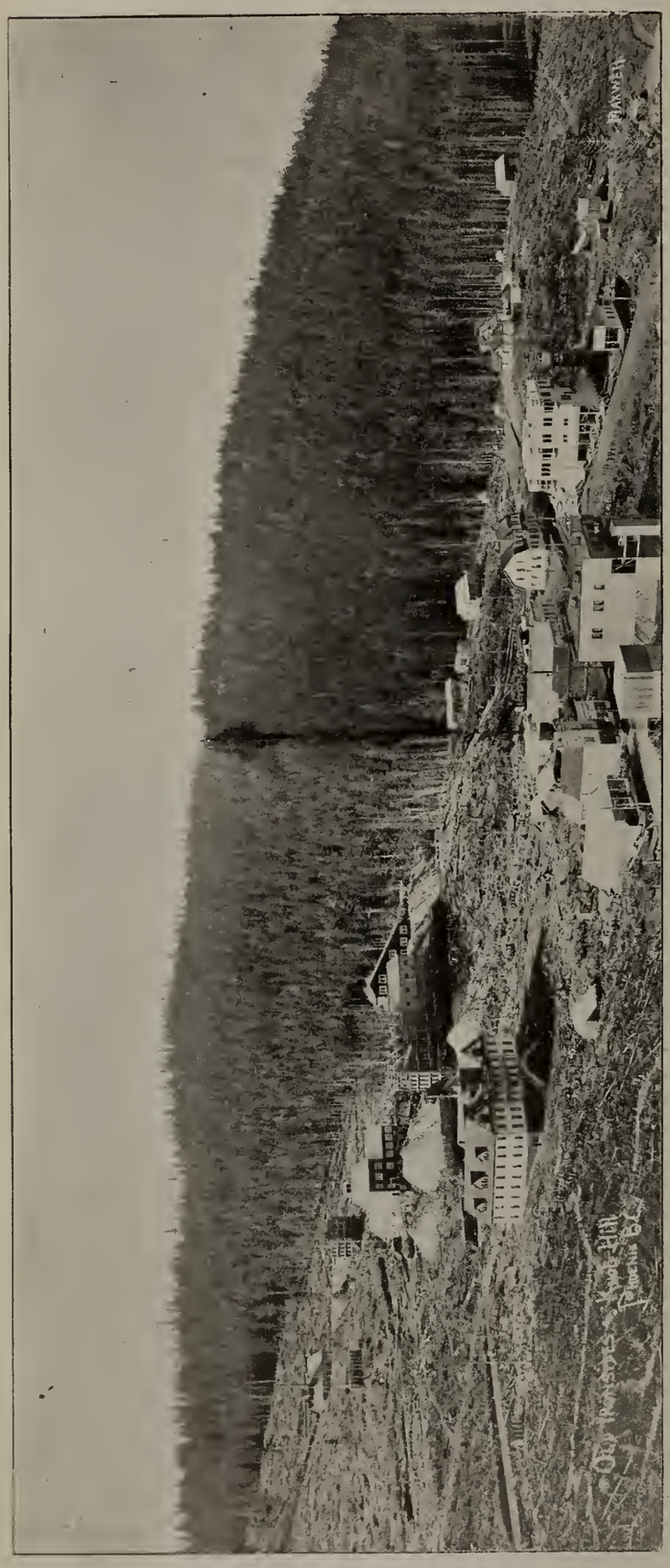
As is well known, our entire plant is run by electric motors, which are driven from the main electric generator situated in a power house, about 1,000 feet below our main works.

I might say in this connection that since we started we have not had occasion to stop five minutes on account of any break or repair to our water power or electrical system.

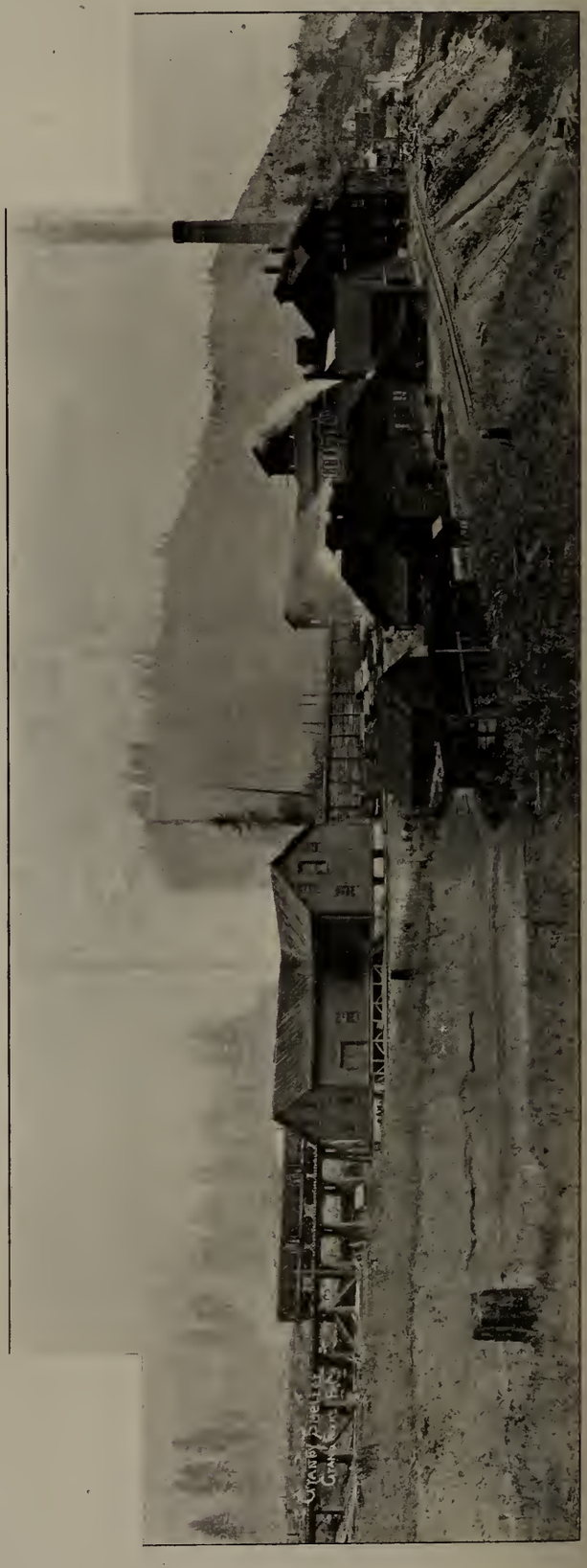
Our sampling and crushing plant, which has been in operation for the past 10 months, and crushed and sampled 170,000 tons of ore, and which has a capacity of 800 tons per day, has been very satisfactory, and has only shut down at short intervals to replace crusher plates, which, of course, wear out.

As our ore is low grade, the works were built with a view to handling large quantities with the least possible labor and expense, and from the time the ore arrives at the smelter it is not handled with a shovel once until it is deposited on the dump as granulated slag and the matte shipped to the East to be refined.

GRANBY CONSOLIDATED MINING, SMELTING AND POWER CO. LIMITED.



Knob Hill, Old Ironsides, Grey Eagle and Victoria Mines, Phœnix, B.C.



Granby Smelting Company's Works, Grand Forks, B.C.

GRANBY CONSOLIDATED MINING, SMELTING AND POWER CO. LIMITED.

Furnace in Operation, Granby Smelting Company's Works, Grand Forks, B.C.

Old Ironsides Shaft House No. 2 and Ore Bunkers.

To save shovelling the coke and charge into the furnaces by hand I invented and patented a furnace charging car, which does away with hand feeding, and it has been in continual operation ever since we started the works last August. This is the only one in use in Canada, and is a great labor-saving machine.

We think that we are smelting copper ore as cheap, if not cheaper, than any other smelting company in Canada or the United States, for the following reasons: It is well known to smelting men that the cost of smelting is made up of four large items—1st, cost of coke; 2nd, cost of power to run works; 3rd, cost of labor; and, lastly, the character of the ore smelted.

In regard to the first, the cost of coke is fixed by the coke people and railroad freights, and while this is not as large as it is in some parts of the United States, it is still too high in proportion to our low grade ore, and we hope some day to see it reduced.

The cost of power in our case is at a minimum, as every one knows that water is the cheapest power.

In regard to labor, I will say that the wage in this country is exceedingly high, and the only way to bring this cost down is to so arrange the plant with mechanical handling of ores and fluxes that the number of men employed is small.

As to the last cost, due to the character of the ore, our mine produces self-fluxing ore, which means that no flux is required. That is, we have no iron ore or limestone to buy or take up room in the furnaces; our ore does not require any preliminary roasting; it contains just enough of sulphur and copper to make a 50 per cent. copper matte, which is required in the next step of the process of separating copper from the other values.

From the above it will be seen that we have ideal conditions, and it is these ideal conditions with which we are surrounded which enables us to handle our low grade ore at a profit, which might not be possible if we had to generate power by steam and coal, buy iron and lime fluxes, roast our ore or reroast and resmelt our matte to bring it up to 50 per cent. copper for the converter.

Ever since we started the ore from the mines arrives at the smelters in two trains daily comprising 10 to 11 cars of 30 tons each to each train, and during the past 10 months there was hardly a day but which saw the regular tonnage arrive with the regularity of clock-work. This has been the greatest surprise to experienced mining men in this country, as there is no where on record, I believe, a case of a mine jumping from a purely development stage into a producer of 600 to 650 tons per day and keeping it up without a stop for ten months, which we have accomplished.

This proves two things:—1st, that we have an enormous ore body to work on, and 2nd, how well the management of the mines laid out and planned and worked out the developments to produce this large tonnage.

The ore is taken out of two small single compartment shafts, one long tunnel and one open cut, and the machinery at the mines at present, one might say, is only light and suitable for development and prospecting work.

It is the intention of the company this summer to begin the sinking of a large 3 or 4 compartment working shaft, equipped with large modern hoisting machinery and large compressors.

In view of the success we have made so far, our company has decided to double the smelting capacity of the works, and contracts were let with this end in view, and we propose to instal the following plant:—

The ore bins at the works will be increased in number to hold about 5,000 more tons.

A new ore sampler and crusher of a thousand tons daily capacity will be built.

Two new 44 x 160 inch water jacket copper furnaces, with their necessary complement of motors and blowers.

The flue dust chambers will be enlarged 250 feet; enough waterwheels and electric generators will be added to the water power plant to bring up the total horse power available to 1,080 h p.

Besides this, the next step in copper metallurgy will be added:—that of converting copper matte into metallic copper.

This converting is a distinct and separate department and process by itself, and will be the most modern and up-to date in existence anywhere.

All the converting machinery will be installed in a steel building 160 feet long and 68 feet wide, and will contain two 72 x 100 inch barrel type converter stands with a combined capacity of 80 to 110 tons of matte per 24 hours.

Each converter stand will have three extra converter shells and three reclining stands; also a 20-ton tilting reverboratory furnace to receive matte from the 4 blast furnaces and converter slag and charge the converters with their charge of matte.

At one end of the building will be located the quartz crushing plant and grinding pan to mix and prepare the linings for the converters, as in this process of converting the iron in the matte attaches to the lining, so extra shells with new lining are being constantly prepared to take the place of those which are eaten out by the process of converting.

This lining plant is quite an item in itself, and consists of a 9 x 15 Dodge crusher, one set of 24 x 16 in. rolls, one 10 in. bucket elevator, one 6 ft. grinding pan, and a 45 h.p. motor.

A 40-ton 40 ft. span travelling electric crane runs the entire length of the building and handles the charge of matte, and also changes the converter shells.

Another 10 ton electric crane runs in front of the 4 blast furnaces and brings the molten matte from each furnace to the tilting furnace.

The converters are rotated when pouring the copper into moulder by an hydraulic cylinder controlled by a valve at the converter.

An hydraulic cylinder also tilts the reverboratory furnace when pouring out the matte for the charge.

The copper mould carriages are also moved by hydraulic power.

A short distance from the converter building is located the blowing engine house. In this building is a large 36 x 36 inch blowing engine, run by a 200 h.p. motor. This engine delivers compressed air to the tuyeres of each converter, which sets up the chemical action which gives us metallic copper from matte.

In this building is also the high pressure hydraulic pump which moves the various parts as above described.

The contracts for all the improvements were let last March, and are all to be in the ground by the middle of July. At the works here, at the present writing, all the stone foundations are in, also the concrete foundations for all steel buildings and large machinery. The timber work on the ore crushing plant and ore bins will be completed during June, when the installation of machinery, part of which is on the ground, will begin.

We hope by September or October to have our new work finished and in operation and handling at least 1,250 tons of ore per day, besides converting our matte.

Our converter plant is really larger than we need, but we anticipate treating matte from other Canadian smelters, thereby saving them the long haul to the Atlantic seaboard.

We have so designed the works that we can still add two more copper matting furnaces, which would make our plant complete, thereby giving us a daily capacity of nearly two thousand tons per 24 hours, which is large enough for one plant.

COAL MINING AND TRADE.

By the accession of Mr. T. J. Brown to the general management of the Old Sydney Mines, the Dominion Coal Company lose one of the ablest and most promising of their officials, and by a turn in the whirlgig of time Mr. Brown returns to the scene of his earliest labours. It is little more than a year since we had the pleasure of congratulating him on being appointed assistant to the resident manager of the D. C. Company, and now, whilst still a young man, he succeeds to the management of the historic mines which have been associated with the Island of Cape Breton for nearly 100 years. Now that this property has passed into the hands of the Nova Scotia Steel Company, it has taken on a new lease of life, and if the policy, already outlined, of opening up a large mine on the Point Aconi areas is carried into effect, Mr. Brown will have on hand an enterprise worthy of his powers, and one which all who know him are assured he will successfully accomplish.

The large shaft at Dominion No. 2 is rapidly approaching completion, being down 790 feet, and it is expected that the Phalen seam will be cut at 800 feet. This will crown an undertaking commenced two years ago and prosecuted with energy ever since. In the earlier stages of the sinking many difficulties had to be contended with, chief among them being a heavy influx of water, and several reputations were buried whilst contending with it. Once, however, the water-bearing strata was passed through things went more smoothly and nothing now stands in the way of a successful finish. Whilst the sinking has progressed to the Phalen, work has been carried on in the Harbour seam and during the present season a tonnage reaching 500 tons daily is likely to be shipped. Very little can be raised from the Phalen for a year, as it will take this time to complete equipment and development, but in 1902 there is no doubt 2,000 tons a day can be shipped, and from that figure the increase will be constant until 4,000, and possibly 5,000, tons are reached—in any case this may become the largest mine in the world—as every condition is favourable to an enormous output. We doubt, however, whether the idea of large outputs is not being carried too far. There is no physical impossibility in raising as much as 10,000 tons a day from one mine, but "the game is surely not worth the candle," as it is certain such concentration passes the limit of economical working, and we shall be surprised if Dominion No. 2 with an output of 5,000 tons a day ever ships coal as cheaply as Dominion No. 1 with 2,000 did in 1898. There are those who think that the "craze" for big tonnages has become "crazy."

The annual report of the Dominion Coal Company possesses several features of note to which attention may be called. First among these is the substantial increase in output since 1895, when the total was 884,000 tons as compared with 2,044,877 tons in 1900. The ratio of increase is much greater during the latter half of the term owing to the extensive installations of machinery, and the Directors state that this will still be the most important feature of their future development, as it is the only means of securing a large output.

The fact that no dividend can be declared on common stock after such a record year in the coal trade as the last when all over the world enormous profits have been made by colliery owners, will come as a surprise to those who are not acquainted with the actual conditions, and is in any event a matter for regret. It will probably be many years before such another boom arrives with a practically unlimited demand for coal at $3.50 to $4.00 a ton f.o.b. Although the receipts for coal are not given separately in the balance sheet, being mixed with the steamship returns, we have it on good authority that the average selling price was about $2.25, an increase of only 50 cents a ton over the previous year. This was due to the obligations incurred by the company under low priced contracts, which claimed nearly 90 per cent. of the output, and in face of the advances in wages and materials it is not surprising that the profit is even less than in 1899. At the recent arbitration in Halifax it was officially stated that if the advance in wages asked for was granted it would involve the company in an actual loss on the year's trading and the arbitrators in their award cited this as the chief element in governing their decision. The whole situation is a comment on the policy which has kept mine development at a low ebb during the lean years and so prevented the company from reaping the benefit of the first good trade which has existed since their incorporation. With such splendid natural advantages as they possess there is no reason why the mines should not have been equal to an output of at least 5,000,000 tons, the whole of which could have been disposed of at $3 to $4 a ton, and deducting 2,000,000 tons for contract liabilities, there would have been a surplus of 3,000,000 tons, an increased profit for the year of at least $4,000,000, which would have put the company in a healthy financial position and afforded a handsome dividend as well. It cannot but be a matter of regret that this golden opportunity has been missed and that after seven years' trading the common stock still stands at 34. How dearly the company has paid for its experience is sufficiently shown by the gradual increase in capital expenditure, and we can only hope that the lesson has been well learnt and that the policy of the future will be continual development in mine work until a capacity of four or five millions is reached, as we have little doubt this tonnage will be required within a few years, and the experience of everyone who has been in the coal trade confirms the opinion that no trade is so subject to extreme fluctuations or so excessive in its demands when "boom" time comes along, but of its approach there are few indications and the notice is generally so short that unless preparation has been continuous it is impossible to participate.

Without intending the slightest disrespect to the American gentlemen who have hitherto formed the majority on the Board, we can express our satisfaction that recent changes have placed Canadian capitalists of the highest standing in control of this Canadian concern, and the more active interest being taken in the management by such men as Sir Wm. Van Horne, Mr. James Ross, Mr. R. B. Angus and Mr. L. J. Forget, is a good omen for its future. A more enlightened policy is already discernible and we believe there is a great future before what should be one of the greatest and most prosperous coal companies in the world.

The operations of the Port Hood Coal Company have been retarded by continual difficulty in connection with their shipping pier. This has been a most expensive structure and after costing nearly $50,000 is still of little use. This is due to the effect of wave and storm and an insecure foundation. To those conversant with this coast and with the fiasco at Broad Cove, where the notorious Penn Hussey spent many thousands of dollars in endeavouring to establish a shipping point, the result at Port Hood is not surprising and only confirms the opinion we have held from the first that all the mines on the Northwest shore of Cape Breton will have to ship their product at the Straits of Canso. The cost of haulage will be more than compensated for by having deep water and an open port all the year round. In other respects this company is making good grogress and will realize a fair output during the present season.

The boom in Cape Breton coal areas continues, but is confined to the sellers as there are no buyers in sight at the ridiculous figures asked. "One swallow does not make a summer" and one year's boom in trade does not make a bonanza for speculators in areas. If reasonable prices had been asked several properties would have been sold this season, but a jump from $10,000 a square mile for good areas

to $50,000 for more than doubtful ones has effectually quenched the ardour of would-be buyers and all the properties actually bonded under the influence of last year's trade, except one, have been relinquished. It may safely be said that in Cape Breton there are no coast areas on the market worth more than $10,000 a mile and most are of too speculative a character to be worth that. In any case the boom is subsiding and after this year there will be a plethora of coal on the market until the next rush takes place, and according to the history of the last 50 years that will be just one decade.

There is much excitement and not a little curiosity as to the outcome of the struggle for supremacy in the Crow's Nest Pass. There are three competitors and apparently only two interests. The C.P.R. and the Crow's Nest Coal Co. are playing a hard game for coal areas, whilst the Government is looking on. The C.P.R. and the G.N.R. are fighting out the question of railway extension in East Kootenay and the Coal Company is the looker on. By 30th September the selection of coal areas has to be made by the Government and it is to be hoped the public will get 50,000 acres "of equal value to the residue of the coal lands," as prescribed by the charter. To facilitate this they have allowed the Coal Company to secure Mr. Jas. McEvoy from their service, the only man who, since the lamented death of Dr. Dawson, could efficiently advise them. Meanwhile the C.P.R , who alone can furnish effective competition and cheapen fuel in British Columbia, are looking for six sections and wondering where they will come in after the Government have taken what they want. The public are wondering whether there will be anything left worth having for either after the Coal Company has cornered Morrissey Creek, the only accessible spot remaining. On this creek they are grading for a branch railway and opening a mine on sections outside their freehold and which should in all fairness be secured for the country before it is too late. We have said little on this subject lately, but events are rapidly moving in the direction we indicated several months ago and we see no reason to alter our opinion that the chances of effective competition or of a fair selection of areas for the Government are "slim."

Important discoveries of coal have recently been made east of the Rockies at the entrance to the Crow's Nest Pass. Some of the coals are "coking" and cover a large area. The most important is McVittie and Leitch's property of 10,000 acres, which contains 15 workable seams and is likely to be developed during the present year. We shall have something to say in detail about this important coal field in our next issue.

The deflection of Mr. J. McEvoy from the staff of the Geological Survey at a critical time, emphasizes the importance of the representations made by the Canadian Mining Institute to the Government with reference to the miserably inadequate pay of that department. There are no men less mercenary than the members of that department, but when it becomes a question of the difference between $1800 and $6000 a year no one can blame a man for choosing the latter. It is not suggested that the Government can compete with healthy mining companies in the matter of salary, but it is a well-known fact that the members of the staff would prefer working in their own groove for far less than the salaries which tempt them to leave. We believe it would be only bare justice to raise the salaries of the experienced and qualified men at least 50 per cent. Under the present system they leave just when they are becoming valuable, and in some instances invaluable to the public service, and in the interest of the country it is the worst of all policies to let them go. We hope recent deflections will stimulate the Government a little in the direction of a much needed and too tardy reform.

Manganese in Newfoundland.

Reports from Newfonndland advise the discovery of an immense quantity of manganese. The deposit occurs in an almost flat vein and is situated on the southern shore of Conception Bay, within a very few miles of the famous Bell Isle (or Wabana) Hematite mine, now being worked very extensively by the Dominion Iron & Steel, and Nova Scotia Steel Companies. It is not too much to say that there are many hundreds of thousands of tons of the mineral in sight within considerably less than one mile of the salt water.

Analyses of the ore have been made and show the following results, the specimens assayed being taken at random from the vein :—

Assay No. 1.		Assay No. 2.	
Manganese,	42 per cent.	Manganese,	34.92 per cent.
Silica,	13 "	Silica,	7.00 "
Iron,	2 "	Iron,	3.10 "
		Phosphorus,	Trace.
		Sulphur,	Nil.

The fact that the deposit lies only from three to six feet under the soil, and that it lies almost flat, is sufficient warrant for the cheapness of cost of production, and in the near future there is little doubt that the deposit will be extensively worked.

Dominion Iron and Steel.—The following financial summary was presented at the annual meeting of the company held in Montreal this month :—

Bonded indebtedness	$ 8,000,000 00	
Preferred stock	5,000,000 00	
Common stock	15,000,000 00	
Bills payable	90,808 77	
Accounts payable	545,848 25	
		$28,636,657 02
Property account	$14,551,480 00	
Plant account	9,668,406 42	
Interest on bonds	232,522 32	
Expenses, preferred stock	22,711 13	
Construction material on hand	241,014 89	
Warehouse material	64,500 75	
Bell Island (winter work)	96,440 26	
Freight and advances to vessels	117,075 51	
Operating suspension	76,747 06	
Undistributed accounts Marble Mountain, coke ovens, foundry and R R	63,898 12	
Warehouse suspension	32,854 74	
Manufacturing supplies	530,553 75	
Bills receivable	27,431 66	
Prospecting	6,093 25	
Freight undistributed	14,527 53	
Sundry small expense items	3,548 87	
Accounts receivable	225,431 73	
Bell Island (sales)	19,986 32	
Due from preferred stock	1,435,849 20	
Cash on hand and in banks	1,205,583 51	
		$28,636,657 02

Ontario Graphite Company.—The output of this successful company, last year, was about 2,500 tons graphite of high grade quality, shipped to United States. In addition to the present machinery there is being installed an electric plant of 500 h.p. driven by a water power situated two miles from the mine on the Madawaska River, and a stamp mill having a capacity of 20 tons per day, is being erected, which, it is expected will be in operation by 1st November. The Jenckes Machine Co. of Sherbrooke have the contract for the water wheels and stamps and the Canadian General Electric Co. have the contract for the Electrical plant which consists of a 250 K. W. revolving field 4,400 volt machine, equipped with induction motors, etc., which will supply ample power for the operation of the Air Compressors and all the other machinery as well as the lighting of the same and drying of the ore. The whole outfit when completed will be one of the most up to date plants in Canada and will cost in the neighbourhood of $75,000.00. The deposit has been developed to a depth of 120 feet, showing an average width of 10 feet. About $1,000,000 of graphite is exposed.

Rossland Great Western.—Shipments for month ending May 31st, 2,825 tons, yielding 817 ounces gold, 1,866 ounces silver, 37 tons copper. Estimated value, £6,142.

The British Lion Gold Mining and Development Company has obtained a supplementary charter, enabling it to increase the capitalization from $80,000 to $180,000 The company is operating the Big Four Group, about five miles from Ymir, B.C., and is now in a position to expend considerable sums this summer on the development of its property. The group consists of the Big Four, Hercules, Lerwick and Snow Flake claims. On the Hercules claim there is an immense showing of pyrrhotite ore. The surface assays gave $5.30 and $6.70. The principle work will be done on this claim during the present summer, and will be in ore from the commencement.

Company Law.

By J. M. Clark, M.A., LL.B., K.C.

Mining operations are now so generally carried on by joint stock companies with limited liability that it is somewhat difficult for us to realize that such companies are, so far as English law is concerned, a modern invention.

It was not till 1855, less than half a century ago, that the principle of limited liability was introduced. It was only in 1825 that the famous Bubble Act was repealed. That Act was passed in 1719, 6 Geo. 1 chap. 18 to prevent the formation of dangerous and mischievous companies tending to the grievance of the subjects of the realm. Under this statute a company with shares transferable without restriction was held clearly mischievous. A learned Chief Justice thought such a company tended to introduce gaming and rash speculation to a ruinous extent to the grievance of numbers of His Majesty's subjects. In fact it is well known that the modern idea of a joint stock company met with the most strenuous opposition. Dryden condemned it as a scheme to divide the empty nothing into shares and set the public by the ears—Carlyle denounced it as a mischievous invention.

The idea however has made rapid progress. In England the paid up stock of such companies amounts to over five billion dollars. There they have gone from unlimited liability to limited liability; in Ontario following the example of some of the Western States—we have gone a step further and have mining companies with no personal liability by the shareholders on their stock.

In all mercantile communities questions as to the formation, organization and management of joint stock companies have in recent years received great attention.

In the United States the science of corporations has been greatly developed. There every possibility of corporation law for good or evil has been exploited. In Germany and France there are provisions tending to discourage the investment of small sums in company shares.

In Great Britain the Board of Trade appointed a committee to enquire what amendments were necessary in the Acts relating to joint stock companies incorporated with limited liability, especially with a view to the better prevention of fraud in relation to the formation and management of companies and to consider a report upon the clauses of a draft Bill which was laid before them for that purpose.

This committee, which was appointed on November 12th, 1894 made their report on the 27th June, 1895. In that report the general lines upon which, and the limits within which, the Legislature can safely or usefully interpose are discussed and the committee say :—

"It is a trite observation that legislation cannot protect people "from the consequences of their own imprudence, recklessness or want "of experience. The Legislature cannot supply people with prud- "ence, judgment or business habits. It must be remembered that the "majority of companies are honestly formed for carrying on a "legitimate though it may be a speculative enterprise or business, and "the business is conducted with honesty and reasonable ability and "judgment. In consequence partly of the facilities which exist for "the formation of companies in this country a vast amount of foreign "enterprise and foreign business comes to England. Banking, rail- "way, and other business is now carried on in every quarter of the "globe by British capital and managed by British officials. Accord- "ing to the recent report of the Board of Trade there were in the "United Kingdom in April, 1894, 18,361 companies with a paid up "capital of 1,035,029,835L., whereas the capital of all companies in "France, anonymes and en commandite, was, in December, 1894 "calculated approximately at 420,000,000L. The capital of German "companies was estimated by Mr. Gerb of H. M., Consulate General "in Berlin at 200,000,000L., but Mr. Schuster puts it at 300,000,000L. "The capital embarked in English companies therefore exceeds that "represented by French and German companies together by at least "315,000,000L. The number of persons who are interested either as "shareholders or bond or debenture holders in these companies is of "course enormous. It is obvious that legislation affecting interests of "this magnitude and widespread character demands great caution "and care. Restrictive provisions, which may have the effect of "either curtailing the facilities for the formation of companies which "bring so much business to England or of embarrassing the adminis- "tration of companies, or deterring the best class of men from becoming "Directors, are not to be lightly entertained."

In the course of their investigation the committee came upon a curious instance which they record in their report, where a company was registered in January, 1891 whose capital of £10,000 was divided into 9,600,000 shares of one farthing each and the total subscribed capital was one penny and three farthings.

The committee report that they dismissed from their consideration every suggustion for public enquiry by the Registrar or other official authority as to the soundness, good faith and prospects of the undertaking at the commencement or any other stage of a company's formation.

"On the other hand, it must be generally acknowledged that a "person who is invited to subscribe to a new undertaking has "practically no opportunity of making any independent inquiry before "coming to a decision. Indeed, the time usually allowed between "the issue of the prospectus and the making of an application does "not permit of any real investigation. The maxim of Caveat Emptor "has in the opinion of your committee but a limited application in "such cases."

The ultimate result of the report of this committee was that after much further consideration and many alterations of the draft Act, there was passed the companies Act, 1900 (63 and 64 Victoria, Chapter 48). This Act provided that the certificate of incorporation given by the Registrar of joint stock companies should be conclusive evidence that all the requisitions of the companies Act in respect of registration and of matters precedent and incidental thereto had been complied with, and that the association is a company authorized to be registered and duly registered under the companies Act. This is an exceedingly important provision, and prevents points which created great anxiety under the previous legislation from being agitated. These points were matters considered in what is known as the one man company case, Saloman vs. Saloman & Co. (1897 A.C. 22).

The Act requires a Statutory declaration as to the compliance with these requisitions, and provides that the incorporation of the company shall take effect from the date of incorporation mentioned in the certificate of incorporation. This section of the Statute is expressly made retroactive.

Another very important provision in the new English Act is that contained in section 2, that a person shall not be capable of being appointed director of a company by the articles of association, and shall not be named as a director or proposed as a director of a company in any prospectus issued by or on behalf of the company unless he has by himself or his agent authorized in writing (1) signed and filed with the Registrar a consent in writing to act as such director.

(2). Either signed the memorandum of association for a number of shares not less than his qualification, or signed and filed with the Registrar a contract in writing to take from the company and pay for his qualification shares, if any.

Stringent provisions are made in regard to the qualification of directors. What is one of the most important features of the Act is contained in section 4, which provides that no allotment shall be made of any share capital of a company offered to the public for subscription unless the following conditions have been complied with, namely: The amount, if any, fixed by the memorandum or articles of association, and named in the prospectus as the minimum subscription upon which the directors may proceed to allotment, or

(b) If no amount is so fixed and named, then the whole amount of the share capital so offered for subscription has been subscribed and the sum payable on the application for the amount so fixed and named, or that the whole amount offered for subscription has been paid to and received by the company.

This will effectually prevent the practice, which gave rise to grave scandals, of going to allotment on an obviously inadequate subscription. so that the company was from the start doomed to failure. This amount is referred to as the minimum subscription, and the amount so fixed and named is to be reckoned exclusively of any amount payable otherwise than in cash, and the amount payable on application on each share shall not be less than 5 per cent. of the nominal amount of the share.

If these conditions have not been complied with on the expiration of forty days after the first issue of the prospectus, all money received from applicants for shares shall be forthwith repaid to the applicants, without interest. This section provides that any condition required or binding any applicant for shares to waive compliance with any requirement of this section shall be void.

An irregular allotment in contravention of the provisions of the Act is made voidable at the instance of the applicant, within one month after the holding of the Statutory meeting, and directors are made personally liable for any loss, damages or costs which the company or the allottee may have sustained.

Section 6 of the Act places salutary restrictions upon the commencement of business by a company. These provide that a company shall not commence any business or exercise any borrowing powers unless shares held subject to the payment of the whole amount thereof in cash have been allotted to an amount not less in the whole than the minimum subscription. (b). Every director of the company has paid to the company on each of the shares taken or contracted to be taken by him and for which he is liable to pay in cash a proportion equal to the proportion payable on application and allotment on the shares offered for public subscription, and that there has been filed with the Registrar a Statutory declaration of compliance with the provisions of the Act.

This section also provides for the giving by the Registrar of a certificate that the company is entitled to commence business, and that such certificate shall be conclusive evidence that the company is so entitled.

This provision is open to the objection that it will give the public an unreal sense of security.

The Act also provides for returns as to allotment, and permits the payment of commissions for subscriptions.

In the previous company legislation there were attempts to define what should be in the prospectus of a company. The Directors' Liability Act of 1890 was largely for this purpose, but it was a dead letter. The present Act provides that every prospectus shall be dated, and that a copy of such prospectus shall be signed by every person who is named therein as a director or proposed director of the company, or by his agent authorized in writing, and shall be filed with the Registrar on or before the date of its publication. The Registrar is prohibited from registering any prospectus unless it is so dated and signed, and the Act provides that no prospectus shall be issued until so filed for registration, and that every prospectus shall state on the face of it that it has been so filed.

Section 10 provides:

"(1). Every prospectus issued by or on behalf of a company, or by or on behalf of any person who is or has been engaged or interested in the formation of the company, must state:—

(a) The contents of the memorandum of association, with the names, descriptions, and addresses of the signatories, and the number of shares subscribed for by them respectively; and the number of founders or management shares, if any, and the nature and extent of the interest of the holders in the property and profits of the company; and

(b) The number of shares, if any, fixed by the articles of association as the qualification of a director, and any provision in the articles of association as to the remuneration of the directors; and

(c) The names, descriptions and addresses of the directors or proposed directors; and

(d) The minimum subscription on which the directors may proceed to allotment, and the amount payable on application and allotment on each share; and in the case of a second or subsequent offer of shares, the amount offered for subscription on each previous allotment, and the amount actually allotted; and the amount, if any, paid on such shares; and

(e) The number and amount of shares and debentures issued, or agreed to be issued, as fully or partly paid up otherwise than in cash, and in the latter case the extent to which they are so paid up, and in either case the consideration for which such shares or debentures have been issued or are proposed or intended to be issued; and

(f) The names and addresses of the vendors of any property purchased or acquired by the company, or proposed so to be purchased or acquired, which is to be paid for wholly or partly out of the proceeds of the issue offered for subscription by the prospectus, or the purchase or acquisition of which has not been completed at the date of publication of the prospectus, and the amount payable in cash, shares, or debentures, to the vendor, and where there is more than one separate vendor, or the company is a sub-purchaser, the amount so payable to each vendor; and

(g) The amount (if any) paid or payable as purchase money in cash, shares, or debentures, of any such property as aforesaid, specifying the amount payable for good-will; and

(h) The amount (if any) paid or payable as commission for subscribing or agreeing to subscribe, or procuring or agreeing to procure subscriptions, for any shares in the company, or the rate of any such commission; and

(i) The amount or estimated amount of preliminary expenses; and

(j) The amount paid or intended to be paid to any promoter and the consideration for any such payment; and

(k) The dates of and parties to every material contract, and a reasonable time and place at which any material contract or a copy thereof may be inspected: Provided that this requirement shall not apply to a contract entered into in the ordinary course of the business carried on or intended to be carried on by the company, or to any contract entered into more than three years before the date of publication of the prospectus; and

(l) The names and addresses of the auditors (if any) of the company; and

(m) Full particulars of the nature and extent of the interest (if any) of every director in the promotion of or in the property proposed to be acquired by the company, with a statement of all sums paid or

agreed to be paid to him in cash or shares by any person either to qualify him as a director or otherwise for services rendered by him in connection with the formation of the company.

(2). For the purposes of this section every person shall be deemed to be a vendor who has entered into any contract, absolute or conditional, for the sale or purchase, or for any option of purchase, of any property to be acquired by the company, in any case where :—

(a) The purchase money is not fully paid at the date of publication of the prospectus; or

(b) The purchase money is to be paid or satisfied wholly or in part out of the proceeds of the issue offered for subscription by the prospectus; or

(c) The contract depends for its validity or fulfilment on the result of such issue.

(3). Where any of the property to be acquired by the company is to be taken on lease, this section shall apply as if the expression "vendor" included the lessor, and the expression "purchase money" included the consideration for the lease, and the expression "sub-purchaser" included a sub-lessee.

(4). This section shall not apply to a circular or notice inviting existing members or debenture holders of a company to subscribe for further shares or debentures, but, subject as aforesaid, this section shall apply to any prospectus whether issued on or with reference to the formation of a company or subsequently: Provided that:—

(a) The requirements as to the memorandum of association, and the qualification, remuneration, and interest of directors, the names, descriptions, and addresses of directors or proposed directors, and the amount or estimated amount of preliminary expenses, shall not apply in the case of a prospectus published more than one year after the date at which the company is entitled to commence business; and

(b) In the case of a prospectus published more than one year after the date at which the company is entitled to commence business, the obligation to disclose all material contracts shall be limited to a period of two years immediately preceding the publication of the prospectus.

(5). Any condition requiring or binding any applicant for shares or debentures to waive compliance with any requirement of this section, or purporting to affect him with notice of any contract, document, or matter not specifically referred to in the prospectus, shall be void.

(6). Where any such prospectus as is mentioned in this section is published as a newspaper advertisement, it shall not be necessary to specify the contents of the memorandum of association or the signatories thereto, and the number of shares subscribed for by them.

(7). In the event of non-compliance with any of the requirements of this section, a director or other person responsible for the prospectus shall not incur any liability by reason of the non-compliance, if he proves that :—

(a) As regards any matter not disclosed, he was not cognisant thereof; or

(b) The non-compliance arose from an honest mistake of fact on his part:

Provided that in the event of non-compliance with the requirements contained in paragraph (m) of sub-section (1) of this section, no director or other person shall incur any liability in respect of such non-compliance, unless it be proved that he had knowledge of the matters not disclosed.

(8). Nothing in this section shall limit or diminish any liability which any person may incur under the general law apart from this section."

The Act contains exhaustive definitions of who vendors are, and provides for non-compliance with any of the requirements of the section, and provides that any waiver of compliance with this section shall be void.

One of the most striking features of the new Act is the provision for the Statutory meeting, which must be held within a period of not less than one month or not more than three months from the date at which the company is entitled to commence business. Careful provisions are made to make this Statutory meeting a reality, and to ensure that the shareholder before the meeting shall have full and complete information.

Another important section of the Act makes provision for the registration with the Registrar of joint stock companies of certain classes of mortgages and charges which are defined by the Act. These are not complete, and as to certain other classes of mortgages and charges not covered by the Act, the law is left as it was before.

Provision is made for the rectification of the Registrar, and for penalties for non-compliance with the requirements of the Act, and for the enforcement of such penalties.

The contents of the annual summary required by section 26 of the Companies Act of 1862 are extended, and the present Act requires such summary to be so framed as to distinguish between the shares issued for cash and shares issued otherwise than for cash, or only partly for cash, and shall give certain other information.

Careful provisions are made in regard to the appointment of auditors, their remuneration, rights and duties, but these are not so stringent as the drastic provisions at one time proposed.

Importnnt provisions are made as to the winding up of companies, and as to defunct companies, and for the purpose of rectifying certain abuses in regard to companies limited by guarantee.

Penalties are provided for false statements under the Act.

This most important legislation went into effect on the first of January, 1901, and its working will be watched not only in England but elsewhere with the keenest interest. In Canada the law at present is in a state of unfortunate confusion and embarrassing complication, and it is to be hoped that after a careful study is made of the working of this English legislation company law in Canada, not only the Dominion law but that of the various Provinces, will be placed on a more satisfactory basis. A comprehensive codification of the law affecting joint stock companies is quite feasible and would undoubtedly prove a great public convenience.

The Iron Ore Fields of Ontario.

By WILLET G. MILLER, School of Mining, Kingston.

The iron ore fields to which I desire to refer more particularly are those in what we are now accustomed to call New Ontario. In order however to conform to the title of the paper I shall refer briefly to deposits in the older parts of the Province as well.

The iron ores of the Province are of the following kinds: (1) Bog Ore, (2) Magnetite, (3) Titaniferous Magnetite, (4) Hematite.

We have had in Ontario what may be called two periods of iron manufacture. During the earlier of these, dating from 1800 to about 1855, the ore made use of was of the bog variety, chiefly. This material was found in loose deposits of recent age situated in one of the older agricultural districts. The area in which the industry achieved the greatest success was in Norfolk county not far from the shores of Lake Erie. The method of mining this bog ore was very simple. Trenches or ditch like depressions were sunk in the soil and the pieces of ore of various sizes were picked by hand from out of the earth.

At the picturesque but now forlorn village of Normandale in the

county referred to there was situated a small charcoal furnace all traces of which have now nearly disappeared. The iron produced here was used largely for the casting of stoves and kettles required by the pioneers and quite a trade was carried on with Hamilton, Toronto and other towns to the east. The writer has seen stoves made from this iron in the rural parts of the district not many years ago, long after traces of the furnace had all but disappeared.

It may be of interest to note that much of the charcoal used in the smelting of the Norfolk ore was produced it is said from the timber of the native Canadian chestnut which grows to a large size in that, the most southern district of Ontario. Traces of the old charcoal pits are yet to be seen here and there in the uncleared parts of the country. The eastern limit of growth of these trees is in the vicinity of Hamilton and when they are mentioned they are often mistaken for the common ornamental tree of our towns and cities, the imported horse chestnut. Another tree which has a like limited area of growth in the Province is the black walnut which was also at one time a valuble timber tree along Erie's shores.

The writer takes a special interest in these bog ore deposits as it was in these that he first saw mining operations carried on—during a "boom" in iron long after the Normandale furnace had gone out of blast.

In the same district there are numbers of paint or ochre deposits. These have been worked at different times and are similar in origin to the bog ore deposits but in their case the iron oxide is more intimately mixed with earthy matter than is the bog ore.

In this first iron period, furnaces were also erected in the more eastern part of the Province but they were of less importance. The ore used in these was obtained from bodies occurring in the crystalline rocks of the Laurentian. The sites of the industry here were in Hastings county and on the Gananoque River. The furnaces brought only financial disaster to those connected with them, unlike the Normandale furnace which was run with success from 1822 to 1847. Besides supplying the local market this furnace shipped castings of various kinds across the lake to Buffalo and one shipload of stoves and other castings was sent to Chicago.

SECOND PERIOD.

The second period begins with the mining of ores in eastern Ontario for export across lake Ontario to the centre of the iron industry in the adjacent United States after the furnaces in the Province had ceased operations.

Looking over the Reports of the Geological Survey the first reference I have found to the exportation of iron ore from the Province, relates to the early fifties.

The first furnace, built after the closing down of the Normandale works in 1847, which has met with success, is that erected at Hamilton a few years ago, about 40 years after the closing of the Norfolk furnace. This Hamilton furnace inaugurated a new era and has now two competitors for public favour, one at Deseronto and one at Midland, with two or three others as yet in embryo.

Leaving out of consideration the district in which bog ore was first mined as being now and for the future of no economic importance as a source of ore, our Ontario Ore Fields are divisable into two large areas or what may perhaps be more properly called regions, those of south-eastern Ontario and those of the northern and north-western parts of the Province.

These two regions are rather sharply defined both geographically and geologically.

The south-eastern region contains ores of economic value which occur, with the exception of a few pockets of Potsdam age, in what is known as the Grenville series of the Laurentian. Titaniferous magnetites, of no value at the present time as ores, occur here as well as in various other districts of the Province.

Then there are the deposits, which are now beginning to attract so much attention, which are found in what is known as the Huronian series in the north and west.

In all our geological literature a quite sharp distinction is made between the Grenville and Huronian series of rocks. Whether this distinction will be found to hold in the future is of little importance to us in connection with a consideration of their respective iron ore deposits of economic value. So far, however, as the characters of the iron ore deposits are concerned the two series are quite distinct. The enclosing and associated rocks in the two regions are quite different in origin and appearance.

In the south-east many of the magnitite deposits have one wall of crystalline limestone and the other of gneiss. In other cases gneiss is the enclosing rock on both walls.

In the newer districts of the Province the associated rocks are of totally different character and jasper or other closely related silicious material is a constant accompaniment of the ore bodies.

SOUTH-EASTERN ONTARIO.

We shall first deal with the ores of the first developed or south-eastern region.

The ores of economic interest here are of two kinds, magnetites and hematites. The former occur largely as contact deposits, as already stated, the wall on one side being in many cases composed of crystalline limestone while the other wall is some form of gneiss, often the scapolite-holding variety.

The two districts in this part of the Province which have been developed to the greatest extent are situated along the Kingston and Pembroke, the Central Ontario and the Irondale and Bancroft railways.

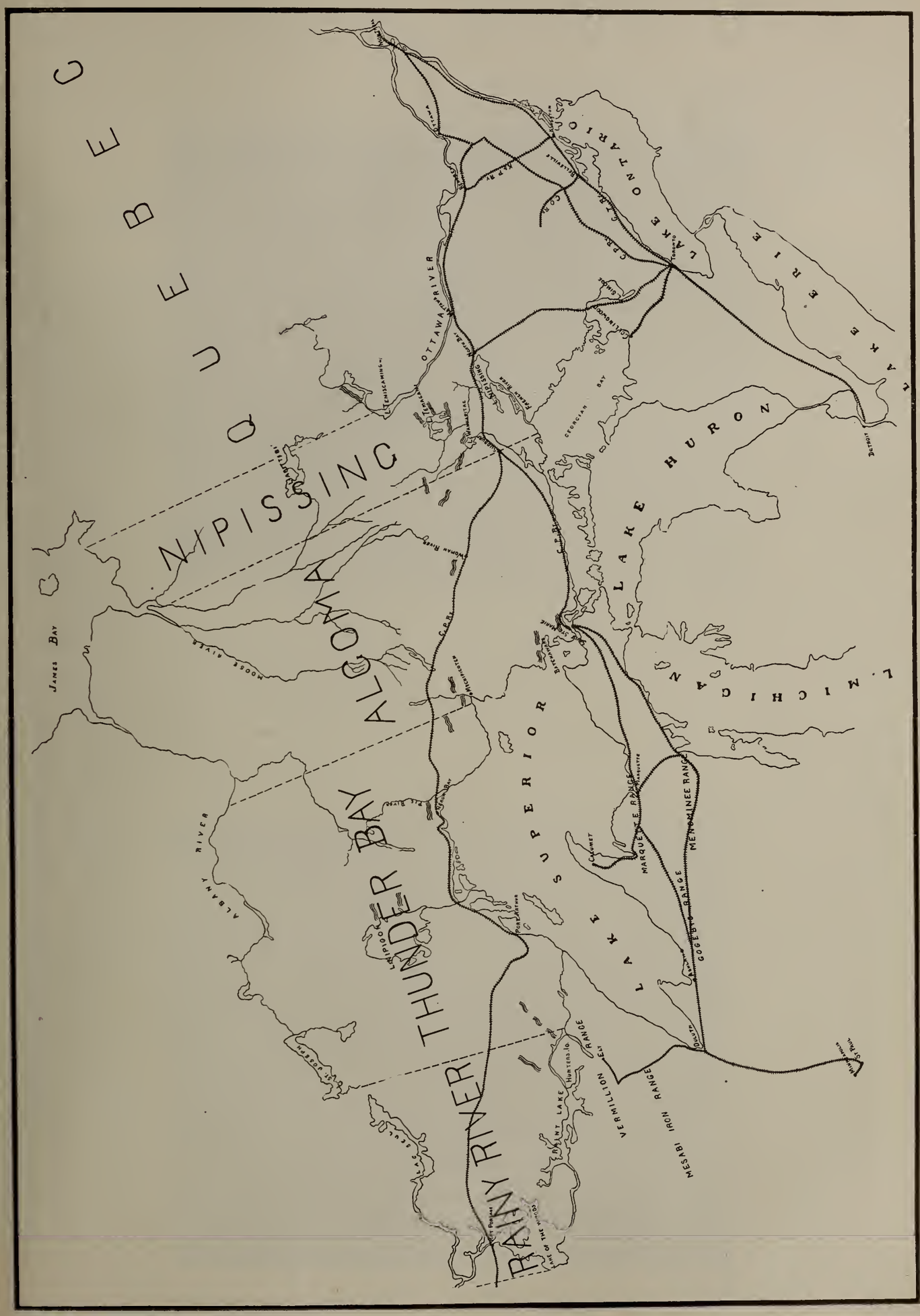
Along the first mentioned road the deposits which have been worked in recent years are found at different points for a distance of about 50 miles, beginning 30 miles north of Kingston. All the deposits recently worked here are composed of magnetic iron ore. Much of this is coarse in grain and thus differs in appearance from the characteristic fine grained and slaty magnetites of the north-western region. Outside of silicious material many of these ores are very pure but the ore from a few deposits contains enough sulphur to lower its grade.

Years ago some hematite deposits were worked in the district lying east of the K. & P. R., the most important being in Lanark county.

Along the C. O. R. the magnetite deposits which have attracted most attention are those of Belmont and Coe Hill although much has been done on a number of others. The deposit which has been worked most continuously along this line of railway is, however, composed of hematite and is known as the Wallbridge mine. Years ago this deposit was thought to have been worked out and was so described but during the last few years it has produced a considerable amount of good ore.

One of the chief reasons for the beginning of the construction of the Irondale R.R. was the transportation of iron ore from a number of deposits known to be situated in the district traversed by it. Some of these have been worked at different times. They are all magnetites.

Although high grade ore is obtainable from many of these deposits in south eastern Ontario, they are of smaller size than those of the Lake Superior region and are thus to some extent handicapped. No doubt, however, now that the Province is becoming an iron producing country of importance these deposits will be the scene of con-


QUEBEC
NIPISSING
ALGOMA
THUNDER BAY
RAINY RIVER
LAKE SUPERIOR
LAKE HURON
LAKE ONTARIO
LAKE ERIE
L. MICHIGAN
JAMES BAY
MOOSE RIVER
ALBANY RIVER
OTTAWA RIVER
GEORGIAN BAY
DETROIT
CHICAGO
MARQUETTE RANGE
MENOMINEE RANGE
GOGEBIC RANGE
VERMILION LAKE
MESABI IRON RANGE
HUNTERS ISLAND
POINT LAKE

siderable activity and the ores will always be in demand for special purposes. Only recently ores have been shipped from the Kingston district to Pennsylvania to be used in the production of high grade steel.

The smaller size of the deposits is partly compensated for by the fact that they are situated in districts in which labour and supplies are cheaper than in any other mining district in the Province. Moreover if methods were adopted in their handling such as were advocated by Dr. Douglas in his paper read before this Institute two years ago the output of merchantable ore could be greatly increased.

TITANIFEROUS MAGNETITES.

Before proceeding to a description of the newer ore fields I will refer briefly to the deposits of titaniferous magnetite which occur throughout the Province generally. These ores are of no economic importance at the present time although in the past material of this kind has been successfully smelted in other countries and the metal produced from it was of a high quality.

Numerous deposits of ore of this kind have been found in the Province from the area bordering the Rideau Canal, in the most eastern part, to the Rainy river district in the west, and they are often of large size. As is well known they are believed to be of a different origin from non-titaniferous ores and are classed among ore deposits of igneous origin. They are associated with basic rocks, gabbros, and are believed to represent basic secretions from molten magmas which were composed for the most part of material now making up the gabbros. The ore shades off gradually into the gabbro.

Some five or six years ago while investigating the composition of some of the dikes of eastern Ontario we found that they contained an unusually high percentage, for this kind of material, of nickel. As the dikes possess a similar chemical composition to gabbros and are found in the same district as some of the titaniferous ores, it occurred to me that these ores should also contain nickel, if as believed they were of igneous origin. I therefore suggested to Mr. F. J. Pope who was then a post-graduate student at the School of Mining that he should test samples from a number of deposits for the presence of nickel. Mr. Pope undertook the work and found all the magnetites of this class examined by him to contain a small percentage of nickel. Afterwards he proceeded to Columbia University and while associated with Prof. Kemp he analyzed a number of samples of titaniferous ores from various deposits in New York state, all of which were found to be nickeliferous. Mr. Pope also found that the element vanadium is universally present in ores of this class, a fact of considerable interest bearing on the distribution of the rarer elements.

During the last few years Prof. Kemp has given considerable attention to the study of the titaniferous iron ores of New York state while those of Scandinavia have been studied by Prof. Brogger.

Mr. Rossi of New York has carried on detailed experiments with these ores in the blast furnace and has achieved results which he claims prove that the ores are of economic value as a source of iron and ferro-titanium.

If any important commercial use were found for the element titanium whereby it could be utilized as a by-product the ores would be in demand. Two or three years ago such a use was thought to have been discovered in dyeing and numerous enquiries were received in Canada concerning our supply of titaniferous ores.

The occurrence of nickel in these ores is of interest for two reasons. Since our nickeliferous deposits of Sudbury are thought to be of igneous origin the belief is confirmed that the nickel-bearing titaniferous deposits are of similar origin. Moreover the occurrence of this metal in these ores may explain the fact why the iron produced from them was of a high quality as regards strength and toughness.

These titaniferous magnetites are generally, if they contain much titanium, of a darker and duller color than ordinary magnetites and one familiar with their appearance can recognize them in hand specimens and can thus avoid the expense of having them analysed. Moreover knowing their mode of occurrence with a certain class of igneous rocks the deposits can be distinguished in the field and can be thus put down as being of no present economic value and not worth any development work or expenditure for analysis.

THE NEWER ORE FIELDS.

The more recently discovered iron ore ranges in the northern and north-western parts of the Province occur widely extended in a region of great size.

The noted ranges of the United States practically surround the southern and western shores of Lake Superior, lying in the states adjacent. The ranges in Ontario which, so far as they have been examined, occur under similar geological conditions, have recently been found to occupy much of the territory bounding this great lake along its eastern and northern shores The accompanying map shows that the Ontario ranges occupy a greater extent of territory than do those to the south and west of the lake and so far comparatively little systematic searching for iron ore ranges on this side of the line has been carried on. The location of these ranges has been discovered in most cases by accident, by prospectors and explorers who were engaged in other work.

The most striking characteristic of these ranges is the occurrence in them of bands of jasper or other closely related silicious material. This material usually occurs in the form of layers a few inches in breadth interbanded with iron ore which is in some cases hematite, in others magnetite.* When the jasper has a red color the interbanded material presents a remarkable and unique appearance.

The width of the belts of this interbanded material stretching across the country is often 600 feet or more. Some of the belts have been known to prospectors in Algoma and other parts of north-western Ontario for years but few of these men were acquainted with the iron ore districts to the south of Lake Superior and hence attached little economic importance to the outcrops, the iron being so intimately mixed with the silicious material as to be of too low a grade for mining. Some of the more silicious material when first found, during the gold excitements, was assayed for the precious metal but this being found to be absent no further attention was paid to the deposits. The fact was not known that under certain conditions, determined by the geological structure, ranges in which only lean ores are exposed at the surface are worthy of careful investigation.

In the states lying immediately to the south and west of Lake Superior the conditions of occurrence of workable deposits associated with leaner ores are now well understood. On some of the ranges in these states no ore deposits of value were found during the early explorations and the ranges were condemned. This is especially true in the history of the Mesabi range which has been proved to contain ore bodies of larger size than possibly any other part of the world. Although considerable work had been done on this range of a prospecting nature it was not till 25 years after it had first attracted attention as being possibly an ore area of value that workable deposits were discovered. Ore bodies were first opened up on this range in the early nineties and now the output of iron ore reaches an enormous number of tons annually.

The geological structure of the Mesabi range is somewhat different from that of most of our jasper-iron ranges. Those in this country appear to be more like the Marquette, Vermillion and others of the states adjacent to Lake Superior.

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* Figs 1 and 2.

FIG. I.

Photo by W G. Miller, 1900.

Interbanded Jasper and Magnetite, Iron Lake, vicinity of Lake Temegami.

FIG. II.

Photo by W. G. Miller, 1900.

Interbanded Jasper and Magnetite, west side of Snake Lake, Nipissing District, Ont.

The history of some of these ranges has been, however, much like that of the Mesabi and it was only after a great deal of dead work was done on some of them that ore bodies of importance were found.

On the ranges last referred to it has been found that the ore bodies should be looked for in parts of the belt which have been disturbed by igneous intrusions. The most favourable structure seems to be where the jaspilyte, as it is called, or the interbanded jasper and hematite or magnetite, has been cut through by dikes of basic rocks.* In such cases ore bodies of great size are sometimes found resting upon the upper surface or hanging wall of the dikes. The theory is that the iron has been leached from the overlying rocks and carried in solution down to the impervious layer formed by the dike matter and there deposited, replacing the silicious material. Detailed descriptions of the supposed origin of these ore bodies are given in the splendid monographs which have been published on the ranges of Michigan and Minnesota. The diagrams which I show are copied from some of these publications and give a good idea of the relations of the ore bodies to their associated rocks‡. From these it will be seen that numerous ore deposits may underlie an area over the surface of which no ore of economic value is found among the rocks exposed. Great use is made of diamond drilling in determining these hidden deposits.

DISTRICT OF NIPISSING.

During the past season I spent some time on work for the Bureau of Mines in an examination of outcrops of jaspilyte which had been reported a few months before my visit as occurring in that part of the district of Nipissing lying west of Lake Temiscaming and stretching to the Algoma boundary.

As this is the only jaspilyte area that I have examined in any detail I shall give a brief description of it. The description will serve in a general way for the other known newer Ontario ranges all of which are of similar origin and character, and will apply in a general way to some of those to the south and west of Lake Superior.

Part of the district occupied by these iron ranges of Nipissing has been geologically surveyed by Dr. A. E. Barlow and I shall use his classification of the members of the Huronian system.

According to Dr. Barlow there are three series of fragmental rocks belonging to the Huronian of this district. The lowest of the three is composed of coarse fragments and is known as the breccia-conglomerate. Above this is a series mapped as graywacké and slate. Overlying this again is quartzite. Associated with this fragmental series are igneous rocks of various characters some of which cut through the different series while others are of older age.

The fragmental rocks appear to have at one time covered the most of the surface of this part of the district. They have however been worn down and are now found occupying more or less disconnected areas in depressions of the underlying igneous masses. Hence the outcrops of jaspilyte although they form at times continuous bands some miles in length are disconnected and the jaspilyte range which we traced across Nipissing, between Lake Temiscaming and the Algoma boundary, is not continuous. Breaks occur in the range at places some miles in length. This is compensated for however by the fact that in some places there are two or more roughly parallel belts of jaspilyte. This is owing apparently to the series in which the jaspilyte occurs having originally been in a horizontal position. Afterwards it was folded. Since then the tops of the folds have been worn off and the jaspilyte bands as we now find them represent the legs of denuded anticlines and hence run in parallel positions.

Much of the jaspilyte is greatly bent and fractured and the cracks in it are filled in with quartz.

The jaspilyte is associated with the middle member of the Huronian, the graywacké and slate. This fact is of course of importance to prospectors; knowing in what member of the Huronian the jaspilyte occurs they will not waste time in searching for iron ore bodies among other members of the series.

A rather striking feature of the field is that a belt highly impregnated with pyrite and sometimes with pyrrhotite is found running parallel to the jaspilyte belt in almost every instance. Sometimes the pyritous belt is almost in contact with the jaspilyte, at other times it is a half mile or more distant.

The association of these two belts was of considerable assistance to us in our work of prospecting. This part of the district has received considerable attention from prospectors during the last few years as it appeared to be a continuation of the Sudbury nickel belt which lies to the south-west Consequently almost every rusty outcrop in the field examined by us had attracted the notice of nickel hunters and many of the outcrops had been stripped and had some blasting done on them. After we learned the relation which these rusty zones bear to the jaspilyte we had a key to the occurrence of the iron formation and by working off at right angles to the pyrite belt we were able to discover outcrops of jaspilyte.

It would appear as if some of the bodies of pyrite are of considerable size and they will be of economic importance as soon as a railroad is built into the district. Pyrite is now much in demand as a source of sulphur. In addition to sulphur, analyses which I had made show that the pyrite often contains other materials which will be of value as by-products. Gold values were found running from traces to $3.40 per ton, copper from 0.28 to 0 91 per cent., nickel from traces to 0.36 per cent. as well as traces of cobalt and in the cases of specimens from two outcrops traces of platinum were also found.

The map shows the position in a general way of the outcrops of jaspilyte we examined in the stretch of country running from a little west of Lake Temiscaming by way of Lake Temagami south-westward to the Algoma boundary. No bodies of soft ore or hematite were found associated with these outcrops but bodies of magnetite of considerable promise occur at some points. The discoveries of soft ore bodies outcropping at the surface are not numerous in other districts and this is not to be wondered at when we consider that they are much more easily worn down by agents of denudation than the harder magnetite and outcrops containing a higher percentage of rock matter.

If a number of ore bodies are not found in association with some of this jaspilyte the range will have to be considered to possess a unique character as no such great length of belts of similar character, in which no ore bodies of importance occur, are known in other districts. Of course considerable work may have to be done before the ore bodies are brought to light, just such work on has been done on some of the ranges of Michigan and Minnesota.

On beginning our work in the field we thought that the outcrops occurring in the vicinity of Lake Temagami were likely part of a belt running in a north-west direction as a jaspilyte band was found some years ago, during the survey of the boundary between the districts of Nipissing and Algoma, a little north of Shining Tree lake near the 61st mile post. As our work proceeded, however, we found that these Temagami outcrops form part of a belt which runs somewhat south of west and shows exposures of jaspilyte a short distance north of Lake Wahnapitae and in the township of Hutton on the boundary line. Properly the outcrops in the neighborhood of Temagami should be said to form two or three roughly parallel bands. The nearest outcrop of jaspilyte to Lake Temiscaming, which here forms the boundary between Ontario and Quebec, so far discovered is situated on McDonald creek. It is described as being of small size and I did not examine it.

Farther west numerous outcrops are found near the north shore of the north-east arm of Lake Temagami. A few miles north of this,

* Figs 10 and 11.
‡ Fig 2.

exposures are found south-west of Net lake and along the shores of Vermillion and other lakes westward to the shores of Kokoko lake, a distance of about 10 miles. Some of these outcrops have a breadth of 600 feet or more and, from the relations which they bear to certain ignious intrusions, give promise of being of economic value.

A band of jaspilyte also runs in a direction somewhat south of east from Austin Bay the southern extremity of the south arm of Lake Temagami to Cross Lake. Westward this band extends to the islands lying along the eastern shore of the south-west arm of Temagami.

On Emerald lake 8 or 10 miles west of the last mentioned exposures jaspilyte is also found.

Further west again, as already stated, outcrops are found a short distance north of Lake Wahnapitae and in the township of Hutton which lies along the western boundary of the district of Nipissing.

Most of the exposures so far discovered are in the vicinity of easily accessible water courses. It seems likely therefore that other outcrops will be found in the intervening areas.

A sufficient number of outcrops has however been found along this strip of country between Lake Temiscaming and the Algoma boundary to form what may be called a more or less broken belt across the whole extent of this part of the district of Nipissing. It appears moreover that there is a belt of similar character across the district some 40 miles to the north. The reason for believing that a belt of jaspilyte occurs in that part of the district is owing to the fact that in addition to the outcrop near Shining Tree lake, on the western boundary, there are also outcrops on the Quinze river which lies in the Province of Quebec, some miles east of the eastern boundary of the district of Nipissing and about 80 miles almost directly east of the Shining Tree outcrops. The area intervening between these two widely separated outcrops has not all been geologically mapped. The geology of the greater part of it is known however and the most of it is underlain by that member of the Huronian in which the jaspilyte is to be looked for.

Before turning from the description of the jaspilyte belts of Nipissing I may refer to the fact that the proposal has recently been made that the Ontario Government should construct a railway in the near future from North Bay station on the C. P. R. to the head of Lake Temiscaming. This proposal seems to have met with practically universal approval among financial and business men. Judging from the unanimity with which the proposal has been received it would appear that the district is assured of an outlet for its mineral and other products.

If this road is built by the Government as proposed its construction will inaugurate a new era of railroading in Ontario and I have no doubt that every mining man will welcome the change.

I have also understood that the building of a canal from the Georgian Bay, by way of the French river to North Bay is a live issue. If both the railway and canal are built these iron ranges of Nipissing will be better situated, so far as shipping facilities are concerned, than any of the great ranges whose outlet is Lake Superior. The ores from Nipissing after a comparatively short rail haul can be loaded on boats and reach Lake Huron without having to pass through the congested Sault canals.

ALGOMA DISTRICT.

I am not familiar from personal examination with the jaspilyte outcrops which have been found at numerous places in the district of Algoma but from the descriptions which have been published of them they seem to be similar in origin and in character generally to those of Nipissing. Some of these, those of Batchawana Bay and Michipicoton harbour, have been known for years but like many of our other mineral fields little attention has been paid to them till quite recently and systematic and careful work is now only beginning to be done on them. Already one ore body, described as being of great size, has been opened up not far inland from Michipicoton harbour and I have not the least doubt that other great iron deposits exist in other parts of Algoma.

I am indebted to Dr. A. P. Coleman for an account of the general distribution of outcrops of jaspilyte and material of similar origin in Algoma so far as at present known.

The map which accompanies this paper shows the relations which these outcrops in Algoma bear to each other and to those of the district of Nipissing.

I take the following outline descriptions of the belts in Algoma from a letter of Dr. Coleman. Referring in the beginning of his letter to those of Nipissing he states: "Similar bands have been found crossing Niven's line just north of Shining Tree lake, traced for about 3½ miles; and between Onaping and Meteor lakes, running somewhat east of south for a similar distance. One has been reported north of Woman river but was not visited by my party last summer, so we have nothing of it in detail. Then there is a Laurentian area and a wide gap. The next band of the sort is about 9 miles northeast of the "Soo" where cherty or quartzitic rock interbanded with magnetite is found but only in small amounts.

"North of Batchawana bay there are two bands each from 3 to 5 miles long, the southern one, 7 miles from the bay, of jasper with hematite running east and west; the northern one, 9 miles from the bay, is of cherty or quartzitic character with magnetite bands and runs north-easterly.

"The next point to the north is Gros Cap near Michipicoton harbor, where sandy and cherty rock is interbanded with hematite Twelve miles inland is the Helen mine, mainly of red hematite but mixed with "blue," brown and yellow ores, said to average about 58 per cent. of iron of fair quality though containing too much phosphorous to be of Bessemer grade. The deposit is stated to be 1,000 feet long from east to west and 400 feet wide with a proved thickness at one point of 288 feet. To the west of this rises a hill 450 feet high through which runs a belt of rather impure siderite perhaps 100 feet thick, probably the source of the ore.

"Then follows a gap to Eleanor lake where banded sandy layers and iron ore occur. A few miles northeast probably the same belt crops out near Parks lake where a red hematite deposit said to be promising, is being explored. Some miles north of this a band of cherty and jaspery rock with magnetite occurs near Magpie river. The next important extensions of the range are near the head waters of Dog river at Paint lake where sandy magnetite occurs and a belt of similar rock parallel to it a few miles north, where a promising ore deposit is said to have been found by Prof. Willmott. These are east of Dog river, but the range extends to the west as jaspery iron ore for several miles, Iron lake being on the way."

THUNDER BAY AND RAINY RIVER DISTRICTS.

"The next point is near Pic river, north of Heron bay, where large masses of banded sandy rock and magnetite occur.

"Finally jasper banded with iron ore has been found east of Nipigon lake at two points some miles apart.

"Though these various stretches of silicious rock interbanded with iron ore differ a good deal in appearance they probably represent the same horizon. Up to the present the only large deposit proved to exist is the Helen mine, but two others, in the hands of the Clergues, are of promise and are being explored. So far as I am aware no other parts of the scattered iron ranges are being worked at seriously."

Dr. Coleman kindly placed this information at my disposal in answer to an inquiry made by me concerning the location more particularly of the recently discovered outcrops in Algoma and Thunder Bay districts. Hence he did not consider it necessary to refer to

occurrences known to exist for a number of years in another part of the latter district. The deposits to which I refer form a belt which strikes from the Minnesota boundary north-eastward into the Thunder Bay district for a considerable distance. The deposits on this range which have attracted most attention include those situated in the vicinity of Hunter's island on the international boundary and others lying 30 or 40 miles to the north-eastward in the vicinity of Greenwater and Shebandowan lakes and farther eastward on what is known as the Mattawin iron range.

A part of the Canada Northern Railroad now being built from Port Arthur to Winnipeg passes within a few miles of these more northern outcrops and thus encourages the opening up of the deposits Up to the present little work has been done on this range on account of the lack of shipping facilities. During the past year, however the government diamond drill has been at work on the Mattawin and this and adjoining parts of the range are considered by those who have reported on them to be of a promising character.

This belt stretching from the international boundary is undoubtedly a continuation of the celebrated Minnesota ranges and it may be of interest to quote the opinions of United States geologists on the character of that part of the range lying in Canadian territory. The Messrs. Winchell in their Report on the Iron Ores of Minnesota make the following statement:* "Outside of Minnesota the belt of chloritic schist which carries ore passes into Canadian territory by entering Hunter's island. There is great probability of the existence of valuable deposits of iron ore on Hunter's island, and also further northeast in the direction of their strike."

There is also the Atikokan range which is now I believe being opened up on quite an extensive scale. The ore is said to be a rather coarse grained magnetite. This range lies in the Rainy River district near the line of the Canada Northern Railway.

SHIPPING FACILITIES.

It will be seen from the map that most of the Ontario ranges are as well situated as regards shipping via Lake Superior as are those which have already been developed on such a large scale to the south and west of this great lake. As regards the shipping facilities of the ranges of the district of Nipissing it is likely that in the future, as already pointed out, they will have an outlet via Lake Huron direct and will then be better situated than the Lake Superior ranges.

It may be well for comparative purposes to give the distances traversed and the rates charged per gross ton (2,240 pounds) from mines of the various United States ranges to ports of Lake Superior.

The following statement is taken from Vol. IV. of the final report of the Minnesota Geological Survey, p. 597.

	Rate.
From Marquette range east of Republic and Michigamme to Escanaba, distance not over 65 miles.	$0.52
From Marquette range at Republic and Michigamme	0.67
From Marquette range to Marquette, 15 miles	0.32
" " " to Gladstone, 60 to 130 miles.	0.52
From Menominee range east of Mastodon to Escanaba, maximum distance 52 miles	0.40
From Menominee range west of Mastodon (Crystal Falls), distance 82 miles	0.43
From Gogebic range to Ashland, distance about 45 miles	0.40
From Gogebic range to Escanaba, distance about 184 miles	0.85
From Vermillion range to Two Harbors, distance 68 to 90 miles	1.00
From Mesabi range to Duluth and Superior, about 75 miles	0.80

* Bull. No. VI. Geol. and Nat. Hist. of Minn.

The sailing distances and average ton rates for 10 years (1886 to 1895) are as follows:—

	Miles.	Contract Rate.	Wild Rate.
Marquette to Cleveland	583	$1.09	$1.12
Escanaba to "	523	0.91	0.915
Duluth to "	823	1.19	1.30
Ashland to "	774	1.19	1.30
Escanaba to Chicago	192	....	....

The average contract rates for 1895 and 1896 were:—

	1895.	1896.
Escanaba to lake Erie ports	$0.55	$0.70
Marquette to lake Erie ports	0.75	0.95
Ashland and Duluth to lake Erie ports	0.80	1.05

From the outline map which accompanies this paper it will be seen that the ranges of jaspilyte and related material are found over a greater extent of territory in Ontario than in the great iron producing States to the west and south of Lake Superior where the ore deposits, the largest known, are of similar origin and occur under the same conditions.

In conclusion, I may say, from what we now know of the iron ore fields of the Province we may feel that Ontario is assured of a great future as an iron ore producing country. Judging from the extent of territory over which the more newly discovered ranges have been found, Ontario should in the not far distant future take her place as one of the chief iron ore producers of the world.

BRITISH COLUMBIA NOTES.

The Ben d'Or Mines situated on Cadwallader Creek, about 70 miles from Lillooet, in the Lillooet Mining Division, are reported sold to a New York syndicate for $750,000. The property is being taken over on an eighteen months working bond; the first payment of $125,000 is to be made on the 25th of June. The Ben d'Or is a producing mine, having shipped bullion almost continually since the completion of their ten stamp mill which is in operation on the property. Recent development work on the property has opened up large bodies of free milling gold ore. Active development work will be commenced on the property at once by the New York people.

The Bennison group of claims, on the eastern slope of the Duncan, on the boundary between East and West Kootenay, will be developed this season by the Kootenay Consolidated Company. The property is managed by Major Clohecy.

The Old Gold property, in the Lardeau, is to be opened up by J. W. Westfall of Trout Lake. Development work will be continued on adjoining properties which are owned by the same company. On the Primrose property, one of the Old Gold groups, there was a new find made late last fall; this property will be thoroughly prospected this season and much is expected from this new discovery.

Rich free milling gold ore is being found at various points in the Lardeau mining division. On Fish Creek, west from Lexington mountain, there has been a discovery of rich free gold ore, while numerous new discoveries have been made on Lexington mountain. Several good discoveries have been made further up Pool Creek in the same belt, while a discovery of very rich gold ore has just been made almost in the town site of Ferguson.

The famous Eva group is located in this free gold belt, and until the Eva property was proven there was little prospecting done for free gold. Prospectors and mining men contended that the country was a silver-lead belt and that there could be no free milling gold properties. Prospectors are now beginning to realize that gold is where you find it, and are just beginning to prospect for gold. There is much excitement in the Lardeau division over the recent discoveries and many prospectors and mining men are going into that country to examine the new finds.

The long tunnel which has been driven on the Highlander mine at Ainsworth has encountered the lead at a depth of 900 feet. The vein is claimed to be of high grade galena ore and more than 27 feet in width, as no hanging wall has been encountered. The values contained in the ore are not known, but it is asserted that the whole vein carries high grade ore.

The Congo group on Red Mountain, in the Slocan district, is to be developed this season by the owners. The Congo is said to be one of the most promising properties in that section of the camp. The lack of transportation has greatly retarded the development of this as well as other properties in the neighbourhood.

Work has been suspended on the Last Chance mine in the Slocan, the reason given for cessation of operation being that the stopes are too wet to carry on mining. Consequently no ore will be taken out until the seepage subsides.

The well known Payne mine of the Slocan has been closed down, the whole force being laid off. It is rumoured that a complete change of management is to occur soon.

The New Denver *Ledge* of the 30th ult. gives the ore shipments of the Slocan and Slocan City mining division from January 1st to May 25th, 1901, as follows:—

	Week.	Total.
Payne		1,486
Last Chance	40	918
Slocan Star	123	594
Ruth		264
Bosum	20	260
Hewett	24	570
American Boy	20	708
Ivanhoe		896
Trade Dollar		140
Sunset (Jackson Basin)		320
Sovereign		117
Wonderful		4
Arlington	100	1,455
Two Friends		40
Enterprise		180
Hartney		140
Black Prince		100
Goodenough		145
Miller Creek		20
Reco		165
Sunset (Can. Gold Fields)		53
Silver King		14
Red Fox		64
Antoine		16
Queen Bess		526
Monitor		345
Corinth		66
Bondholder		23
Rambler		518
Surprise		20
Kaslo Group		10
Chapleau		15
Speculator		10
Ajax		10
Scho		39
Emily Edith		40
Phœnix		20
Alpha		40
V. & M.		20
Colonial		20
Total tons	327	10,391

The tunnel on the Estella and Rover, in the East Kootenay, is now in between 600 and 700 feet. At 260 feet a crosscut was driven which shows 12 feet of ore, another crosscut has 11 feet of ore, while still another has about 7 feet. Stoping has commenced on the Estella tunnel and there is about 100 tons of ore on the dump.

The Whitewater mine in the Slocan district has closed down, with no immediate prospects of re-opening. The reason given for the shut down is that there is no market for their ore.

Several well-known properties in the Trout Lake mining division are to be developed this season. The Miner-Graves syndicate have secured two fine properties, the Virginia and the Cromwell, and will expend not less than $10,000 in development work. A six ton shipment was sent to the smelter last fall from the Cromwell, giving returns of $100 per ton in gold. On the Virginia there has been 100 feet of work done.

The Triune, in the Lardeau, is shortly to start work again. This is one of the richest silver-lead properties in the Kootenay. Shipments up to date have brought returns of over $23,000.00 in all values.

The Metropolitan and Sunset, a couple of North Fork properties, will be worked extensively this season.

The Lorne Mine, in the Lillooet mining district, has closed down. The reason given is that the ore in the lower levels has turned base and can not be treated with the present milling plant.

James McKay Anderson, western manager of the Gold Hill Exploration Company, of Toronto, is in the Lardeau looking after the interests of his company. He intends putting a force of men to work on the Copper Queen group and other properties owned by the company.

The total amount in dividends paid by the Payne Mining and Milling Company is $1,438,000, the largest paid by any mine in British Columbia. The company have on hand $180,000 to construct a concentrator and compressor and do development work. The concentrator is soon to be built, after which a larger force of men will be employed and a larger output expected.

The main shaft house at Bruce Mines, Ontario, was burned. The loss is estimated to be $35,000, with insurance at $20,000.

The International and Happy Medium claims, situated about a mile north of the mouth of Twelve Mile Creek, were bonded by R. E. Fishburn for $12,000. A contract to run a tunnel 100 feet has been let by Mr. Fishburn.

The Silver King Mine, of Nelson, is sinking a shaft 1,000 feet and expect to have it completed within 30 days. This, when completed, will be the deepest shaft in British Columbia.

The Poorman Mine, Nelson, has closed down temporarily owing to an accident to the compressor.

A new discovery of free gold ore has just been made in the Nelson mining division on Six Mile Creek, about six miles from Nelson. The property has just been located, and assays across a 25 foot vein carry values of $24.00 in gold, there being no other values whatever in the ore.

E. Mansfield, the well-known mining man of London, England, returned to Nelson a few days ago. He will resume work on properties in Camp Mansfield.

The Lardeau mining division of the West Kootenay district is coming to the front as a free gold district. Within the last week a number of discoveries of very rich free gold ore has been made. One property has just been located on which there is a 40 foot vein, from which average samples assay $38.00 per ton. New discoveries are being made almost daily, and prospectors from all over the Province are rushing to the district.

C. H. Stillwell, of Montreal, has just bonded the Walrus group of claims, in the Lardeau mining division, from McKay and McKenzie for $80,000. The first free gold property in this district developed to any extent was taken up by A. F. Rosenberger, of the Prospectors' Exchange of Nelson, about a year ago. This property has since developed into a most promising free gold property and has just been sold to an English syndicate for $250,000.

The Noble Five Mining and Milling Company have let a contract to run a 320 foot tunnel to cut the Last Chance vein.

The Hampton group, located at the head of Springer Creek, in the Slocan City mining division, has resumed operations. N. F. McNaut, of Silverton, is the owner and is operating the property. Last year's operations opened up a phenomenally rich shute of ore on the surface, from which two small shipments were made, the smelter returns being 690 ozs. silver to the ton.

Mike O'Brien, of Nelson, has just made a discovery of very rich free gold quartz on Bird Creek, about 12 miles from Nelson. This creek has been thoroughly prospected for a number of years for the ledge from which a very rich float has been found. No particulars of O'Brien's find have been made public, but it is reported that the quartz from the vein is the richest seen in the district.

The Imperial Development Syndicate, of Nelson, have sold the Eva group, in the Lardeau mining division, on which extensive development work has been carried on during the past winter, for something over a quarter of a million of dollars. No details of the deal have been given out, but it is pretty well understood that a local representntative of an English company has taken over the property.

LAKE OF THE WOODS.

Sultana.—Active development is opening up good ground on the Crown Reef, and a recent bore hole from the old workings on the main vein has intersected the Crown Reef, showing a width of ten feet of first-class ore. A broken cam shaft is responsible for the shutting down of a portion of the mill.

Mikado.—The mill at this mine has been shut down but development is proceeding vigourously, the incline being sunk at about 2 feet per day. This shaft is now over a thousand feet deep. The cyanide plant is busy on the old tailings.

Black Eagle.—At this mine, formerly known as the "Regina," the shaft is being enlarged and straightened preparatory to putting in a new hoisting plant. The new management has purchased the steamer Squaw and keeps her busy taking out supplies to the mine. A policy of vigourous development of the mine is to be pursued and it is expected that a new mill of 20 stamps will take the place of the present unique collection of scrap iron before Fall.

Sakoose.—Regular shipments to the mill at Keewatin are being made from this mine and it is expected that the mine will be able hereafter to keep the mill supplied to its full capacity. Mr. Craig, the former manager, has returned to take charge of the mill and Mr. Guess will confine his attention to the management of the mine.

Golden Horn.—A contract to sink a new shaft 100 feet has been let to Ed Hannil. This will be some distance from the old workings, to which it will be connected by drifts.

Grey Eagle.—This property, about 5 miles east of Rat Portage, is being re-opened.

Homestake.—A new hoist and boiler are being installed on this property and sinking will be resumed as soon as possible. Mr. Breidenbach, former manager of the Mikado, is acting as consulting engineer to the company.

The Gold Bullion.—Work has been resumed on this property by Buffalo capitalists.

Manhattan Co.—This company, under the management of J. E. Stanton, of New York, is opening up a fine prospect on Eagle Lake. A fine body of ore has been exposed.

Golden Eagle.—A mill run from this mine is being made at the El Derado mill, on Eagle Lake. If the results prove satisfactory a hoist and compressor will be at once installed and a policy of vigourous development begun.

Big Master —Drifting on No. 1 vein at the hundred foot level is opening up a good body of ore and the "freezing" process mentioned in our last issue being completed, the mine will be developed as fast as possible and the erection of the 10 stamp mill, which is on the ground, will be proceeded with at once. G. F. Bartlett, late of the Corundum Mining Co., of Combermere, will have charge of the erection of the mill. J. H. Webber, M.E., of Oroville, Cal., recently reported on the property.

Twentieth Century.—Recent developments on the property being operated by this company on the Upper Maintou indicate that more dividends will be forthcoming at an early date.

Reliance Co.—This company, operating the Independence Mine, Lower Maintou, will erect the 10 stamp mill now on the ground, at once, and it is expected that the stamp will be dropping by Sept. 1st.

NEW COMPANIES.

BRITISH COLUMBIA.

Columbia Hydraulic Mining Co.—Registered as an extra provincial company, 8th June, 1901. Authorized capital, $1,000,000, in shares of $1.00. Head Office, A. A. Johnson, Atlin, B.C.

Cedar Canyon Gold Mines, Ltd.—Incorporated 8th June, 1901. Authorized capital, $100,000, in shares of five cents each.

Cherry Creek Copper King Mines, Ltd.—Incorporated 10th June, 1901. Authorized capital, $500,000, in shares of $1.00.

Nicola Coal Company, Ltd.—Incorporated 11th June, 1901. Authorized capital $100,000 in shares of $1.00 each.

Mount Sicker and Brenton Mines, Limited.—This company has been incorporated under the laws of British Columbia, with an authorized capital of $1,000,000, divided into 4,000,000 shares of a par value of 25 cents each, to acquire and work the Susan, Copper Canyon, Victoria, Yankee, Anoka, May and Star mineral claims, situated on Mounts Sicker and Brenton, British Columbia. The Directors are: W. A. Dier, A. St. G. Hammersley, E. E. Smith, Elmore D. Dier, F. D. Conway, P. J. Pearson.

ONTARIO.

Gold Mountain Mining Co.—Licensed 13th June, 1901. Working capital in Ontario, $500,000. Head Office, T. A. Gorham, Attorney, Port Arthur, Ont.

Taylor Copper Mines Co., Ltd.—Incorporated 13th June, 1901. Authorized capital, 2,000,000. Head Office, Sault Ste. Marie, Ont.

Manxman Gold Mining Company, Ltd.—Incorporated 20th June, 1901. Authorized capital, $1,500,000, in shares of $1.00 each. Head Office, Sault Ste. Marie, Ont.

Homestake Gold Mining Co. of Ontario, Ltd.—Licensed 13th June, 1901, to carry on operations of a mining, milling, reduction and development company, in Ontario, with a working capital not to exceed $100,000. Head Office, G. H. Draper, Attorney, Rat Portage, Ont.

Black Eagle Gold Mining Company, Limited.—This is the name of the reconstruction of the Regina (Canada) Gold Mine, Limited, which worked the Regina Mine, Lake of the Woods, for a number of years. The authorized capital of the new concern is £100,000, in shares of £1. Mr. F. Peterson, the manager, is busy overhauling the old plant of Tremaine mills, which are to be superceded by gravity stamps.

NOVA SCOTIA.

Dolliver Mountain Mining and Milling Company, Ltd.—One of the most promising of gold mining ventures for the Province of Nova Scotia has recently been completed in the organization of this company of Boston capitalists The property acquired comprises 387 gold areas at Upper Seal Harbour, Stormount District. Vigourous development of the property has been begun and in due course a mill of ample capacity will be installed, utilizing a fine water power on the company's property. The authorized capitel of the new company, which has been incorporated under the statutes of Nova Scotia, is $1,000,000, in shares of $10.00 Ample capital has, we understand, been subscribed for this enterprise. The Directors are: Ernest S. Williams, Geo. T. Cunningham, Chas. F. Crocker, G. J. Partington and Kendall F. Crocker. The company's operations are being directed by Mr. G. J. Partington, a gentleman who has been associated with the gold mining industry of Nova Scotia for a great many years and who thoroughly understands its requirements.

COMPANY NOTES.

Bell's Asbestos Company, Limited.—The Directors beg to submit to the Shareholders the report and audited accounts for the year ended 31st December, 1900. The result of the year's operations is a net profit of £6,994 1s. 10d., to which has to be added the amount brought forward, £1,419 12s. 4d., leaving for appropriation, £8,413 14s. 2d. The Directors recommend:—(1) The payment on the 5th June, of a dividend at the rate of 2½ per cent. per annum, free of income tax; (2) To place to reserve fund, £3,500; (3) To carry forward, £1,913 14s 2d.

Le Roi Mining Co.—Once more the hopes entertained by the shareholders in "the celebrated Le Roi Mine" have been disappointed by the "passing" of the quarterly interim dividend promised them at the close of last year. The shareholders, like those involved in nearly all the London and Globe progeny, have by this time had plenty of opportunities to appreciate the meaning of the oft-repeated phrase: "Man never is, but always to be, blest." When at the close of 1898, the London and Globe and British America Corporations were able to float the Le Roi Mine as a separate company, with a capital of £1,000,000, of which all but £50,000 represented the expanded purchase consideration, the smallness of the working capital was accounted for by the statement that the property had been taken over as a going concern, and that from the ore in sight profits of £360,000 per annum, or over 33 per cent. on the issue, were assured, apparently from the start. That was the promise; but the performance has constituted a "shocking example" of the reckless anticipations upon which so many mining ventures are launched. The accounts for the two years to the end of June last, which were presented to the meeting on December 28th last, showed a total profit of £93,369, or, say £47,000 per annum, instead of £360,000, while the dividend of 5 per cent. paid in November, 1899, is the only return the shareholders, many of whom acquired their interests at from 20 per cent. to nearly 80 per cent. premium, have yet received upon their investment in the company. At the meeting in December Mr. Whitaker Wright said: "It is a great pleasure to me to be able to state that for several months past, and at the present time, after deducting all costs of mining, transportation, smelting, &c., you are earning profits at the rate of 33⅓ per cent," and he also stated that all the capital expenditure, which had proved much larger than the original estimate, would be completed within a couple of months, and that in the then current quarter the directors would be able to pay "their first quarterly dividend of a substantial character, and continue to pay dividends afterwards regularly every three months." This week, however, in place of the expected dividend warrant, the shareholders have received a circular from the board expressing regret that owing to the non-delivery of machinery, due to the severity of the weather, the Northport smelter has not been completed, while a breakdown in the old shaft has cut off, for the time being, that portion of the mine from which the ore was principally being stoped. "In view of these facts," it is added, "the company has not been able to liquidate its indebtedness to the Bank of Montreal, and the directors, therefore, feel that they have no alternative but to postpone for the present the declaration of any dividend." It is, of course utterly discreditable that this "going concern," with its promised profits of £360,000 and its capital of £1,000,000 should be in debt to a local bank, and the only wonder is that Le Roi shares are still kept up at a premium on their nominal value, for their intrinsic value remains an entirely unknown quantity.—*Economist.*

Le Roi No. II.—Shipments to the smelter for the month ended 31st May, 4,290 tons, yielding 1,551 ozs gold, 5,416 ozs. silver, 94 tons copper. Estimated value, £13.517. The directors have declared an interim dividend of 5s. per share, payable on 29th instant.

Le Roi.—Cable:—"Returns for the month ended 31st May. Tons shipped, 22,793, yielding 7,668 ozs. gold, 15,169 ozs. silver, 305 tons copper. Gross value, £54.470."

Hastings (B.C.) Exploration.—Cablegram from the consulting engineer, dated June 13th:—Arlington group of mines.—Trial test mill June 6th. Mill running steadily now.

Bruce Copper Mines, Limited.—On June 12th the main shaft building at the Bruce mines was destroyed by fire. The loss is upward of $35,000, insurance $20,000. The Bruce mines were from 1846 to 1876 very famous as a copper producer. The plant destroyed was just erected and a good example of modern mining equipment. The boilers, warehouse and other buildings adjacent were saved. The company recently completed a large concentrating mill, which started on May 1st, and shipments of copper concentrates had started, 250 tons of ore per day being treated. About 250 men were employed, a number of whom will be thrown out of work temporarily. The plant will be immediately reconstructed. The origin of the fire is unknown. No lives were lost.

British Columbia Copper Company.—Ore shipments from the Mother Lode Mine for May were 9,210 tons, making 28,230 tons for the 5 months of this year. Total shipments to end of May were 33,794 tons. The stopes at both 200 and 300 feet. levels are now in good-grade ore and from these and 2 of the surface openings the daily output ranges from 300 to 350 tons. The lately installed machinery and plant continues to run smoothly and matters about the mine have settled down to a steady producing basis.

B. C. Chartered Company.—From this Montreal Company's Mine at Eholt, B.C., 5,035 tons of ore were sent to the smelter during May. making 20 579 tons for the current year. . Adding last year's shipments, the aggregate output is 40,073 tons. The average copper values obtained run to nearly 7 per cent., while silver was nearly 3 oz. to the ton, with small gold values. Development work continues and the diamond drill is kept at work prospecting both laterally and vertically.

DOMINION COAL.

The following is excerpted from the Directors' Report for the year ended 28th February. Submitted at the annual meeting held in Montreal this month:—

The sales of the company have increased during the past year to the extent of 200,000 tons. Owing to the very satisfactory demand which existed during the greater part of the year, a larger amount could have been disposed of, but the delay in receiving machinery ordered for delivery in time to be of service during the busy season of last year, as well as the increased cost of supplies and the advance in wages not only interfered with supplying the increased demand, but lessened the profits on the quantity shipped.

The business of the company, as will be seen from the subjoined statement, has increased at an exceedingly rapid rate during the last few years, and it was found necessary to increase the plant very materially to provide the required output.

During the last year the company has expended a large amount of

money in these improvements and extensions. Six large air compressors of an aggregate capacity of 3,000 h.p. have been installed. This additional air compressing plant will enable the company to mine a very large portion of its coal by machinery, thus increasing the output per man. This latter consideration is of the utmost importance, as it would be impossible to supply the present demaud with the number of skilled miners available in Nova Scotia.

Besides increasing the output from the older collieries, two new collieries have been opened, one of which is now producing 1,000 tons per day. A large amont of work has been done on Dominion No. 2 Colliery, which when completed will be the largest colliery of the company.

At Louisburg a coal-loading apparatus has been installed, which reduces the time required for loading a steamer to about one-third of that required by the old methods.

A large amount of new work has been done on the railway, in the way of sidings, additional yards, etc. To provide for the additional labour, a large number of houses have been constructed.

It was hoped that the foregoing improvements and extensions would be completed in season to give the output desired in the summer of 1900, but they were not so far completed as to be of much benefit during the summer season; and as a result of this, the company was unable to mine the coal to fill its contracts, and was obliged to cancel some of them, and also to send a large quantity by rail to Montreal in the winter season, at very largely increased expense over the cost of shipping by water.

The company is now in position to supply all present demands, and will make large savings in transportation expenses.

Output in Tons.

Years ending February 28th.

1895— 884,000.	1899—1,295,543.
1896—1,169,785.	1900—1,739,374.
1897—1,221,471.	1901—2,044,877.
1898—1,061,669.	1902—2,600,000. (estimated).

Mr. Donkin, the resident manager, having resigned after five years of faithful service, Mr. C. Shields has been appointed General Manager, and has recently entered upon the duties of this position.

Ten thousand shares of preferred stock have been sold at $110 per share.

Since the close of the fiscal year the sum of $95,743.30 has been deposited in the sinking fund. This, together with interest on $125,000, Reserve Sinking Fund, is sufficient to retire $90,500 of the Bonds of the Company. Adding to this $6,500 Bonds drawn last year, which had not been presented for payment at the close of the fiscal year, reduces the bonded indebtedness to $2,704,500.

FINANCIAL STATEMENT.

For the Year Ending February 28th, 1901.

Net proceeds from sale of Coal and net income from Steamships, Barges, Railroads, Stores & Real Estate, deducting renewals and extensions at mines during the year....		$687,294 88	
Less			
Interest on Bonds.....	$167,670 00		
Dividend on preferred Stock.	213,333 33		
Miscellaneous interest and premium on Bonds retired.	47,348 16		
		428,351 49	
Surplus of net income.....			$258,943 39
Add			
Preferred Stock Premium.....			100,000 00
			$358,943 39
Less			
Sinking Fund for 1900-1901.....			95,743 30
Balance.....			$263,200 09
Disposed of as follows:			
Charged off:			
Wharves and Piers.....	$21,296 35		
Sundry Improvements.....	5,162 06		
International Improvement, 1900.....	18,762 67		
S. & L. Ry. Equipment.....	25,623 13		
Coal Cutting Machinery.....	17,002 56		
Machine Shop Equipment...	16,172 13		
		$104,018 90	
Balance to General Surplus.....		159,181 19	
			$263,200 09

Balance February 28th, 1901.

Assets:				
Property account as follows:				
Amount as per last report.....			$20,249,721 99	
Less credits during year.....			51,930 06	
				$20,197,791 93
Add				
Real Estate purchased.....			$ 35,958 52	
New dwellings erected.....			197,967 16	
New pier at Louisburg.....			25,268 61	
Opening new mines:				
Dominion No. 2.....		$213,358 05		
" No. 3.....		55,401 13		
" No. 4.....		179,327 51		
			448,086 69	
New conveyor at Louisburg.....			70,771 77	
New coal washing plant No. 2		$22,048 72		
" " No. 3		40,032 91		
			62,081 63	
New construction:				
Dominion No. 1..	$63,293 55			
Caledonia.....	49,302 25			
Reserve.....	40,673 92			
		$153,269 72		
New construction, S. & L. Ry....	$91,967 83			
New equipment, S. & L. Ry....	50,000 00			
		141,967 83		
			1,135,371 93	
				21,333,163 86
Cash in banks and offices.....			$140,324 65	
Accounts receivable.....			71,345 86	
Balance due from agents and coal on hand..			555,250 07	
New supplies in warehouses and stores.....			445,327 15	
Insurance suspense.....			4,498 73	
Interest suspense.....			11,511 34	
Steamship hire paid in advance.....			7,895 21	
Cash in New England Trust Co. for sinking fund.....			136,402 08	
				1,372,555 09
Total.....				$22,705,718 95
Liabilities:				
Capital stock, common.....		$15,000,000 00		
" " preferred.....		3,000,000 00		
First mortgage bonds.....		2,801,500 00		
			$20,801,500 00	
Accrued dividend, January and February.....		$ 40,000 00		
Unpaid royalty, Jan. and Feb.		87,616 62		
Accounts payable.....		78,758 59		
Notes payable.....		1,105,000 00		
			1,311,375 21	
Surplus:				
Balance Feb. 28, 1900.....		$433,662 55		
For year ending Feb. 28, 1901		159,181 19		
			592,843 74	
Total.....				22,705,718 95

Sinking Fund May 1, 1901.

$111,800 United States 4s, costing.....	$124,817 62	
Cash for retirement of Bonds.....	104,318 70	
Cash under Article IV.....	1,012 35	
		230,148 67
For		
Reserve Sinking Fund.....	$125,000 00	
Retirement of Bonds, etc.....	105,148 67	
		230,148 67
Balance Reserve Sinking Fund.....	$125,000 00	

Boulder Mine.—The Ash Rapids Co., which is operating this mine, has decided to sink a further distance of 300 feet and to connect 400 feet to the "Stable" vein. The properties of this company have recently been examined by Prof. Chas. E. Van Barneveld, of the State University of Minnesota, consulting engineer of the company. Work will shortly be commenced on the Ash Rapids claim.

LEGAL.

The Sultana Ophir Litigation.

The Supreme Court of Canada at its last sittings gave judgment in a case which has attracted wide attention not only because of its special interest to those concerned in mining ventures, but as well on account of the important constitutional questions involved. We refer to the action brought by the Ontario Mining Company, Limited against Edwa d Seybold of Ottawa, E. B. Osler, M.P. of Toronto, J. W. Moyes, Manager of the Metropolitan Company, E. Johnston of Duluth, E. H. Ambrose of Hamilton, J. W. Brown and John S. Ewart, K.C. of Winnipeg.

The property in dispute consists of the greater portion of Sultana Island and is situate in what was formerly known as the disputed territory. The dispute between the Dominion Government and the Government of Ontario regarding the western boundary of the Province was decided by the Arbitrators in favor of the Province. The Dominion repudiated their award but the Judicial Committee of the Privy Council decided in favor of the boundaries determined by the arbitrators in 1884, and five years afterwards the Imperial Parliament passed an Act declaring the boundaries in accordance with the decision of the Privy Council.

While the territory was in dispute the Dominion authorities assuming that it belonged to them entered into a treaty with the Indians in 1873 by which the Indians ceded to the Dominion a large tract of territory including Sultana Island and the Dominion Officials in accordance with the provisions of the treaty proceeded to set apart a portion of the ceded lands as a reserve for the Indians and known as Indian Reserve 38 B. which was intended to include Sultana Island but this action was not formally approved by Order-in-Council.

In 1886 the Indians surrendered Sultana Island to the Dominion in trust for sale. In the face of the protest of Ontario that the territory in question belonged to her, the Dominion issued, in September, 1888, three different patents of mining locations on the Island to different parties, including the right to the minerals, precious and base, which patents were acquired by the Ontario Mining Company which was incorporated for the purpose of acquiring the whole of Sultana Island except that part belonging to the Sultana mine.

The Privy Council having decided in the St. Catharines Milling case that the territory in question belonged to Ontario these three patents were the only ones issued by the Dominion. The defendants made several prior applications to the Ontario Government for patents of the land in dispute and the Mining Company also subsequently made application to the Provincial authorities to confirm their Dominion patents. The matter was fully argued before the Hon. J. M. Gibson, Commissioner of Crown Lands, by the Hon. S. H. Blake, K.C. for the Ontario Mining Company, J. M. Clark, K.C. for Seybold, and by various other Counsel for the different claimants. The Commissioner decided that a two-thirds interest should be patented to the applicants other than the mining company and that the remaining one-third should go to the company on condition that they would accept it in satisfaction of all their claims. The company refused to accept the conditions or to abide by the decision of the Commissioner and upon patents being issued by the Province to the defendants of the interest awarded to them, the company in February, 1899, commenced an action to have it declared that under the Dominion Letters Patent they are entitled in fee simple to the lands comprised in such patents including the minerals and asking to have the Ontario Letters Patent to the defendants set aside. The Minister of Justice on account of the constitutional questions raised decided to intervene on behalf of the Dominion. The action was tried at Toronto before Sir John Boyd the Chancellor of Ontario.

Eminent Counsel were engaged on both sides. Mr. Christopher Robinson, K.C. led for the plaintiffs and Mr. J. M. Clark, K.C. for the defendants. Mr. G. F. Shepley, K. C. represented the Dominion.

On behalf of the plaintiffs it was argued that the Dominion had exclusive jurisdiction over Indians and lands reserved for them, and that under this authority and under the authority of the Indian Act, the treaty had been negotiated the reserves set apart, the territory in question surrendered and the patents issued and that therefore the Dominion patents were valid and effectual and the Ontario patents void. In support of this evidence was given to show that the Commissioners representing the Dominion at the time the treaty was negotiated, promised the Indians that they would have the benefit of the minerals and that these were expressly granted to the plaintiffs by the Dominion patents.

On the other haud the defendants contended that the lands in question were the property of Ontario as was clearly established by the St. Catherines Milling Case, that the Commissioners had no authority to oust the vested rights of the Province, that their actions and promises to the Indians were ineffectual, that Indian reserves could not be set apart in Ontario without the consent of the Province, that the Province had never acquiesced in the creation of the reserve and that this land had never been validly included in the reserve, that even if this had been part of the reserve the surrender by the Indians enured to the benefit of Ontario and disencumbered the land of the Indian title so that the administrative jurisdiction and the right to grant patents were in the Province alone. They further contended that in any case the precious metals, the gold and silver, were always vested in the Province free from any claim on the part of the Indians. The Chancellor gave effect to the contentions of the defendants holding that the Dominion had no title whatever to the lands or the minerals, but that both were the property of Ontario. He declared the Dominion patents to be void and the Provincial Patents valid, having a rived at the conclusion that the legal effect of the surrender by the Indians was to leave the sole proprietary ownership of these lands in the Crown as represented by the Province of Ontario.

From this judgment the company appealed to the Divisional Court, which affirmed the Chancellor's judgment, but the Dominion Government acquiesced in the judgment of the Chancellor and did not join in the appeal.

The Ontario Mining Company again appealed to the Supreme Court of Canada which again affirmed the Chancellor's judgment.

North Star.

SHIPMENTS TO BE CURTAILED PENDING BETTER MARKET CONDITIONS.

The following is the text of the Directors' Report submitted at the second annual meeting of the North Star Mining Company held at Montreal on 26th instant, and covering the year ended 31st May last.

"The Directors are glad to be able to submit such a favorable statement of the company's operation during the past year. The property is in excellent running order, and the report of the company's manager (to which your attention is invited on the next page) makes it evident that the development work establishes the existence of large additional ore deposits, the contents of which are from their nature difficult to estimate. From the report of the manager your Directors feel confident that as there are large areas yet to explore, additional ore bodies will be discovered.

Although conditions in the mine are, as stated above, most satisfactory, yet your Directors deplore the extremely unsatisfactory conditions existing at the present time for the reduction and marketing of the company's ores. These have lately been aggravated by the low price of lead, but they are primarily due to the excessive charges for smelting, and the high rates of transportation, as a result of which 50 per cent. of the value of the ore is taken for freight and treatment. Owing to these conditions, and in view of the strong financial position of the company, it has been thought wise to curtail shipments, as the Directors believe that better markets can ultimately be obtained.

In conclusion, your Directors beg to ask your careful attention to the report of your manager, Mr. Frank Robbins, and to the financial statements of the company, both annexed hereto."

MANAGER'S REPORT.

During the year 2,141 feet of prospecting and development work have been driven. By means of this work we have discovered the extension of the original ore channel to the south. This is so recent a discovery that, at this time, it is impossible to estimate its extent or its importance. It is not my desire to raise your expectations with reference to this too high; but in justice to the shareholders, to whom I understand this report will be submitted, I cannot let its discovery go unannounced. As I continually have expressed in my weekly reports, I have always felt sanguine that the continuation of the ore deposits was to be found, and I regard this as a confirmation of my belief.

The only other development resulting from the prospecting (I may say that the major part of which has been in connection with this and the preceding) has been in Pit No. 16—500 feet (cir.) south-south-east (S.S.E.) of

the main, or 60 feet tunnel. Here we almost immediately encountered a new and separate channel or deposit of low grade mineral which we have been exploiting in anticipation of finding in connection therewith a body of shipping ore. So far this has not been accomplished, but the conditions are most promising. This, as I have said, being a new channel, the finding of shipping ore therein would be of the highest importance. It may be well to state that practically all the work done here is in mineralized rock. In places there are small quantities of really first-class shipping product, while in others there is a larger quantity of low grade ore easily susceptible of concentration into a good shipping product.

The average value of the ore, from the mine run of the past year, has been 22 oz. silver and 52 per cent. lead.

Before concluding this subject let me say that I have every confidence in the future of the mine; I firmly believe that not only will the present ore channels be found to yield a large quantity of ore in their extensions, but that the development work will disclose others quite as important and valuable.

The only surface improvement which was found necessary during the year was the erection of an ore bin at the upper terminal of the tramway. This has lessened the cost of loading the ore.

The tramway has been a perfect success and has required few if any repairs, beyond the ordinary care of keeping it in order. The most expensive part, the standing cable, shows practically no signs of wear, and the running cable has many months of life in it before it requires renewal.

The machinery and buildings are all in first-class condition, and the mine is in good working shape.

FINANCIAL STATEMENT.

For twelve months ending 31st May, 1901.

ASSETS.

Mines, Mineral Claims and Assets		$1,129,400 20
Permanent Equipment		63,636 91
Office Furniture		870 47
Mine Supplies and Stores on hand, as per inventory		10,790 62
Accounts Receivable		7,449 17
Ore in Transit	$ 13,206 25	
Cash on hand and in Banks	262,407 37	
" Deposited with Canadian Pacific Railway	9,345 04	
		284,958 66
		$1,497,106 03

LIABILITIES.

Capital Stock	$1,500,000 00	
Less in Treasury	200,000 00	
		$1,300,000 00
Accounts Payable		1,309 52
Dividend No. 5. Payable 15th June		39,000 00
Profit and Loss		156,796 51
		$1,497,106 03

WORKING ACCOUNT.

To Cost of Mining, Development and Prospecting	$ 75,431 83	
" Freight and Treatment	354,324 27	
" Ore Tax	6,950 33	
" Tools and Appliances	221 32	
" General Expenses	726 05	
" Montreal Office Expenses	1,308 75	
" Directors' Fees	4,000 00	
	$442,962 55	
" Balance Transferred to Profit and Loss	282,550 19	
		$ 725,512 74
By Proceeds of Ore Sales	$ 719,195 51	
" Miscellaneous Receipts	6,317 23	
		$ 725,512 74

PROFIT AND LOSS.

To Dividends 2 to 5 inclusive	$ 156,000 00	
" Balance	156,796 51	
		$ 312,796 51
By Balance at Credit of Profit and Loss	$ 30,246 32	
" " from Working Account	282,550 19	
		$ 312,796 51

DREDGING FINE GOLD—A short description of the 'mixing tank" system as operated successfully on a dredge is given in a recent issue of the *New Zealand Mines Record*. This method has been in use for many years with the best of results in Australia. It is used at Barrytown. The plant consists of a tank under a screen, about 20 feet long with two partitions commencing at both ends and inclined towards the centre forming a chute which carries the water, sand and coal. Having passed the screen from each end to the centre the material drops into the well or tank. The sides of the tank, near the bottom, being oval shaped causes a boiling and whirling motion in the water which mixes the water, sand and gold. At a given distance from the bottom, an overflow is arranged to draw off the mixture on to the tables. The paper closes with a discussion of the merits of some of the new dredges being built in Australia.

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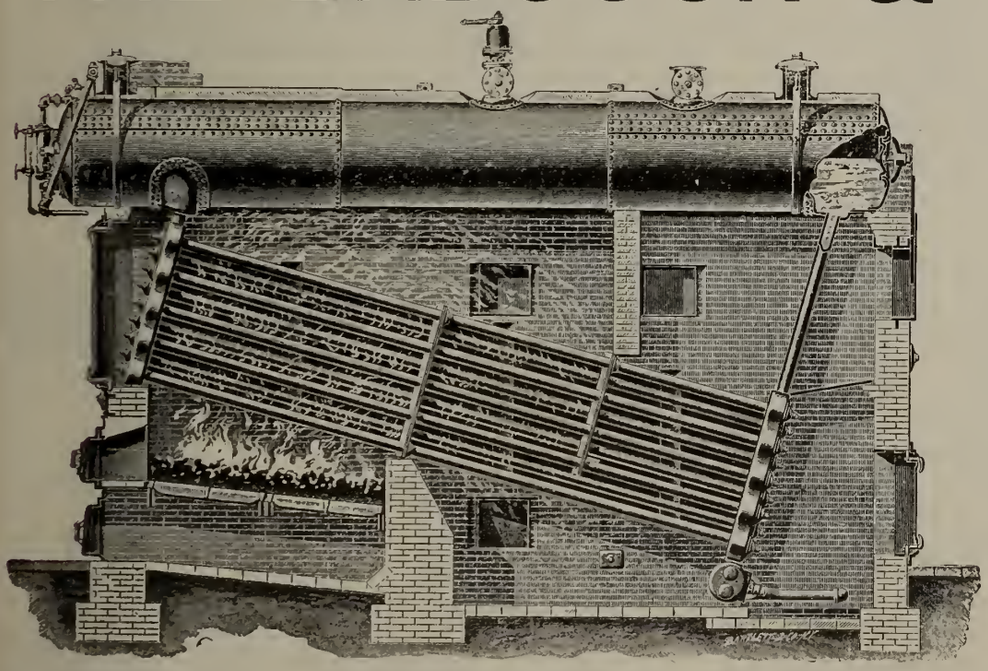

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Proctor's Patent Mechanical Stokers and Self-Cleaning Bars

These inventions have been the subject of a great number of patents and may now be looked upon as complete and well developed machines.

As a proof of the utility of this invention, 8,500 have been fitted up in England.

Also one-fourth of this number have been renewed many of which have been working 20 years, and 65% of the business is from old customers.

These Patents can be taken up either on Royalty or would sell for Cash and small Royalty.

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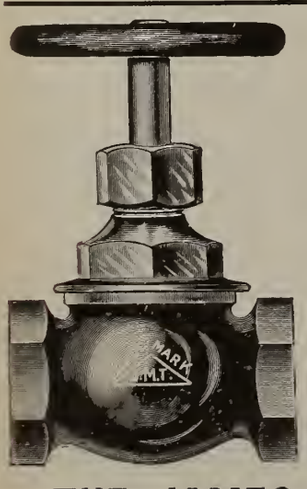

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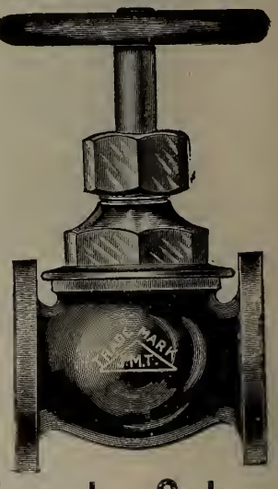

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If you have not used "J.M.T." valves install one where you never could get a valve to hold, the result will be sufficient to prove the quality of "J.M.T." not only the neatest designed and most perfectly made valves but guaranteed by the largest and oldest makers of engineers' brass goods in the Dominion.

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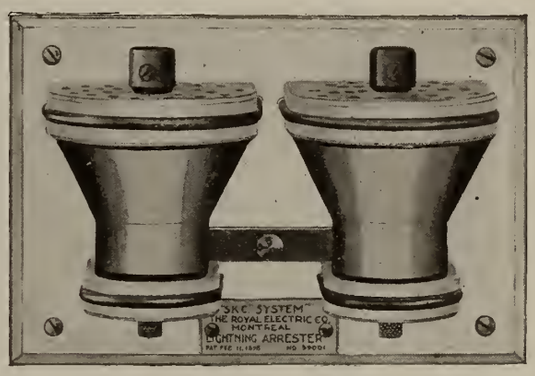

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Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc , apply to

HONORABLE E. J. DAVIS,
Commissioner of Crown Lands,

or

THOS. W. GIBSON,
Director Bureau of Mines,
Toronto, Ontario.

PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN BUNDANT VRIETY.

The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
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PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

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PRECIOUS STONES.

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GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

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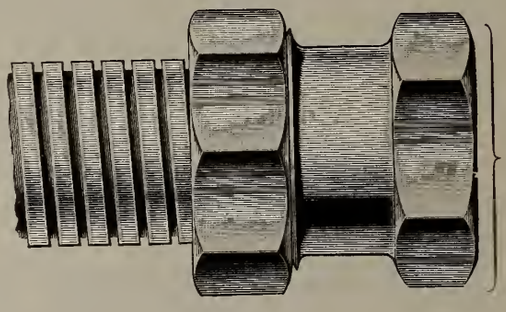

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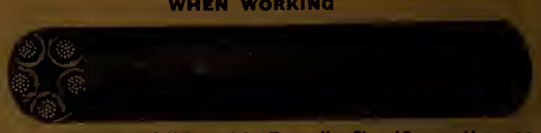

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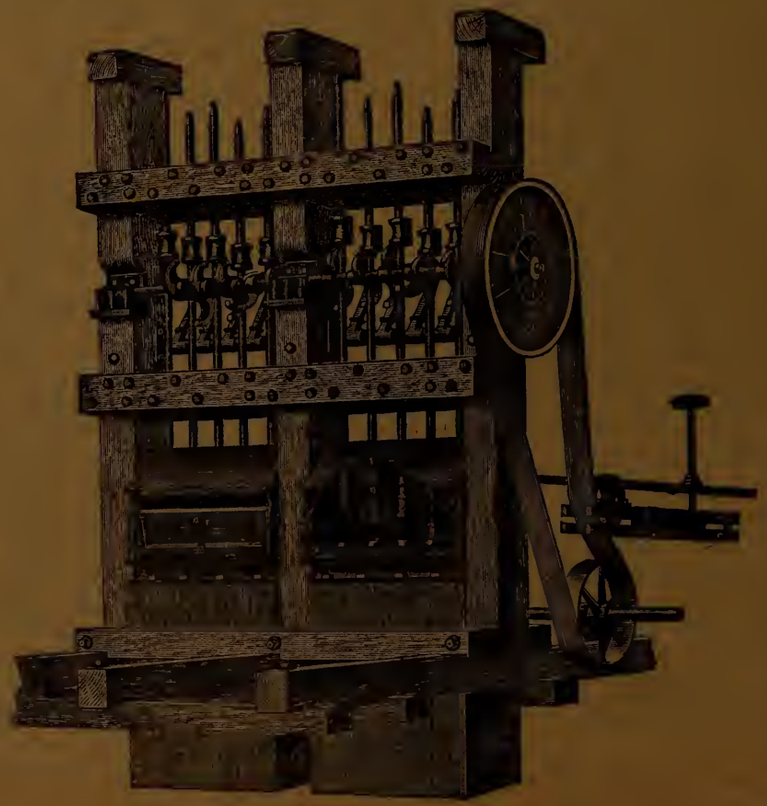

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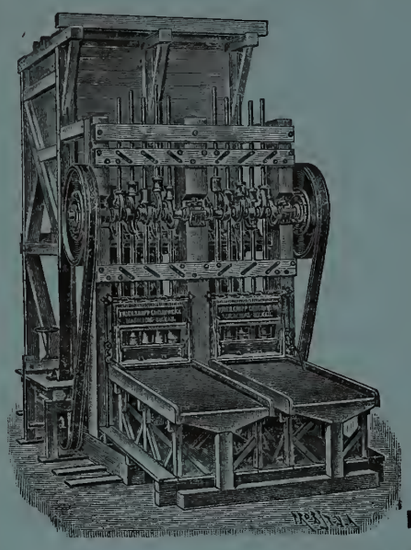

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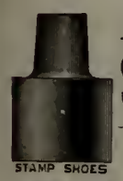

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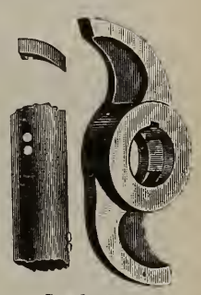

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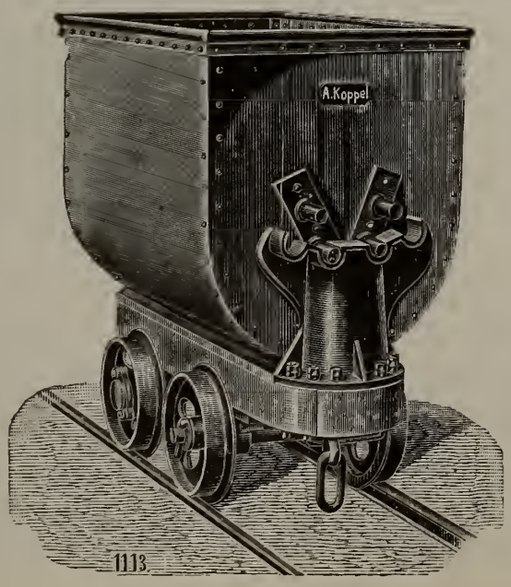

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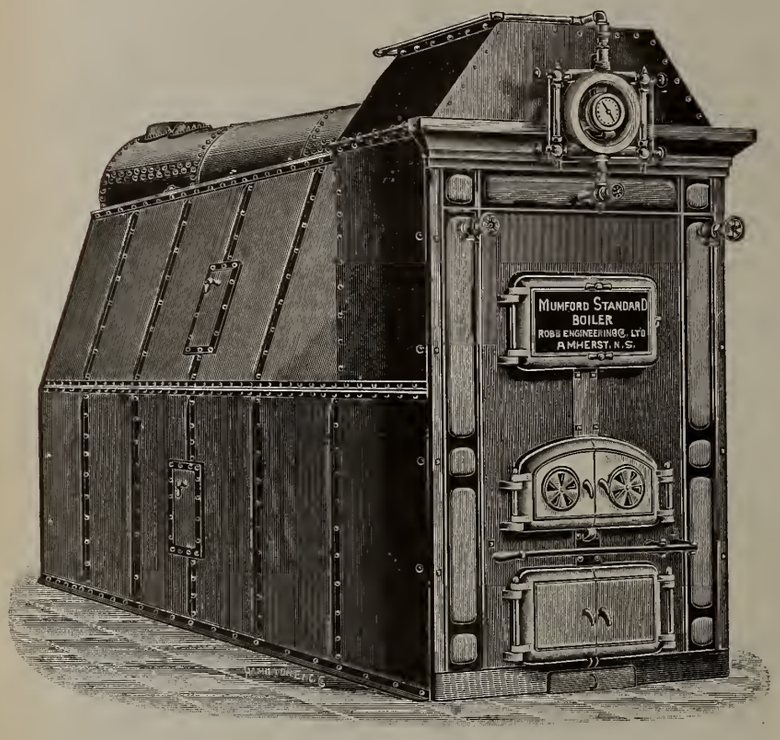

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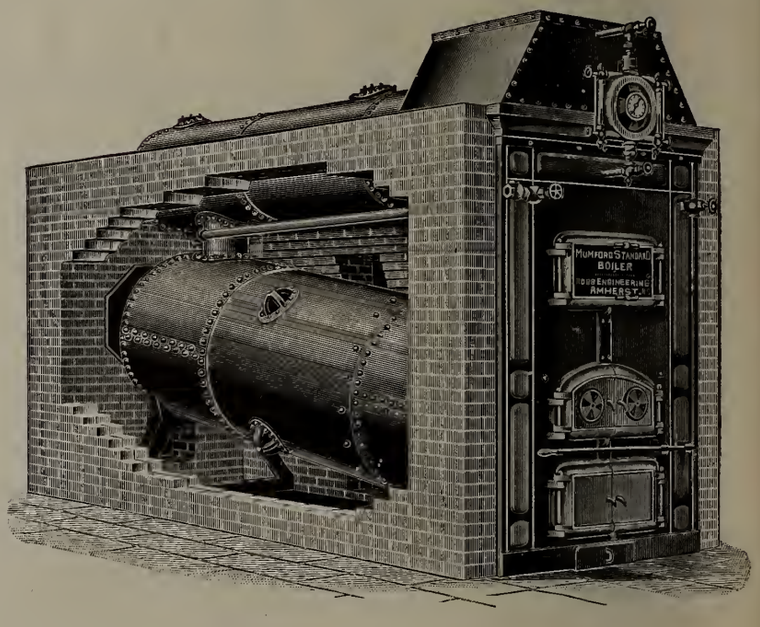

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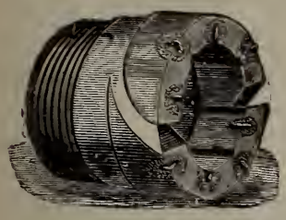

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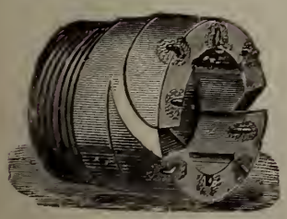

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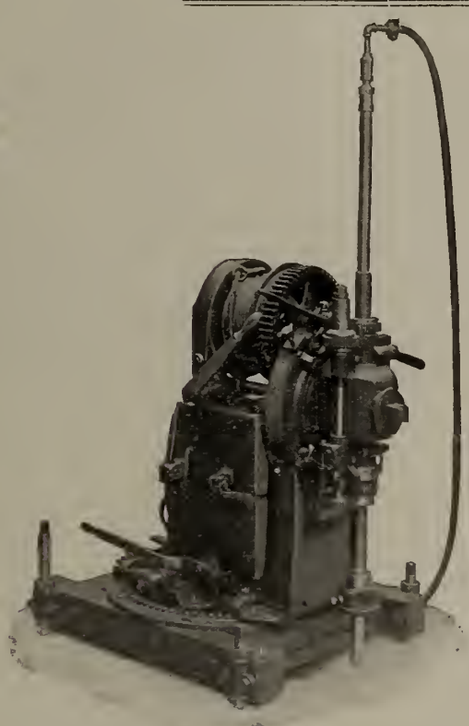

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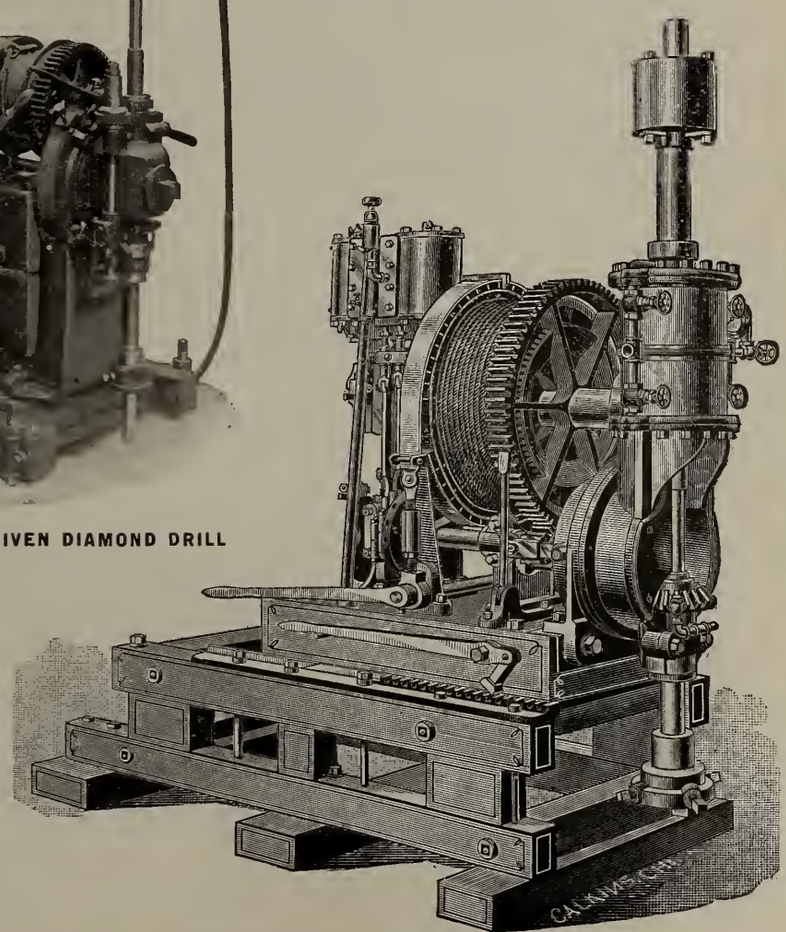

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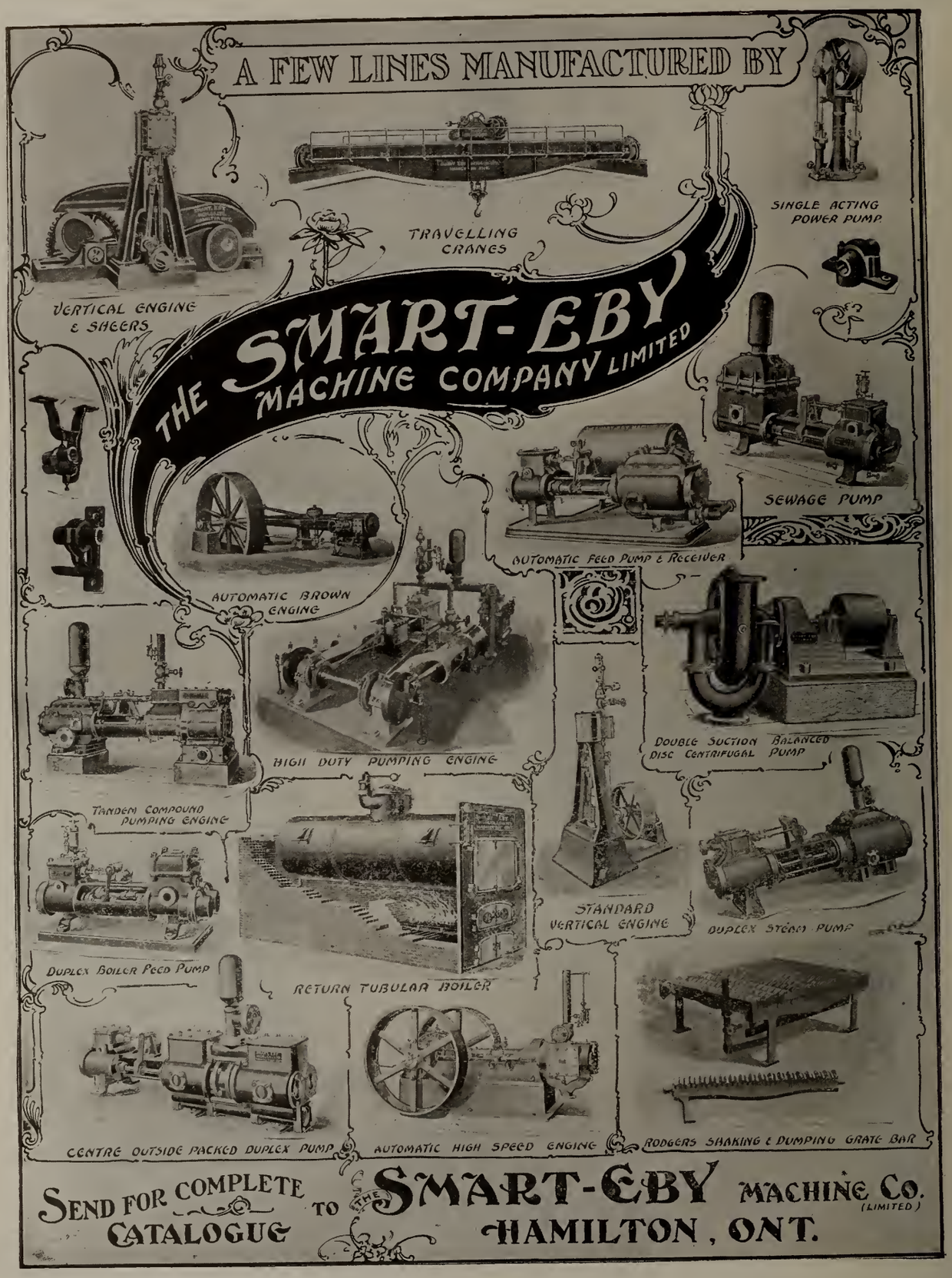
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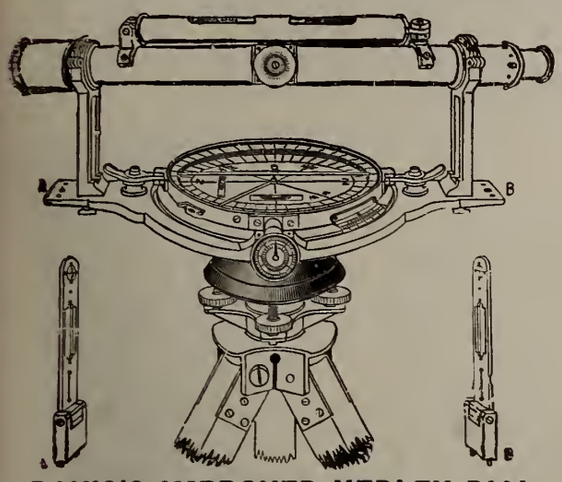

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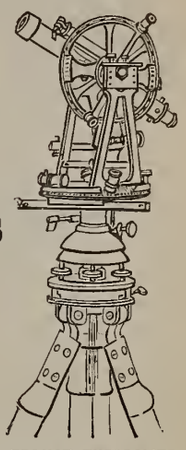

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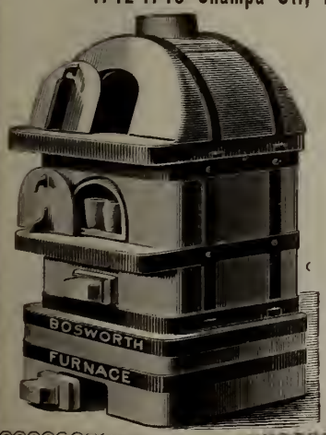

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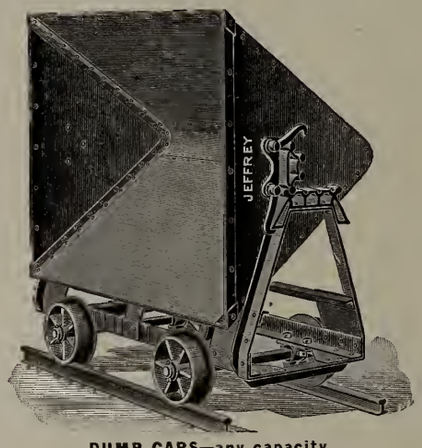

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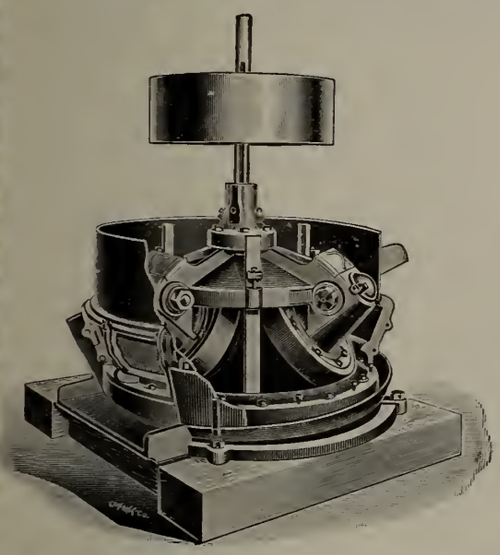

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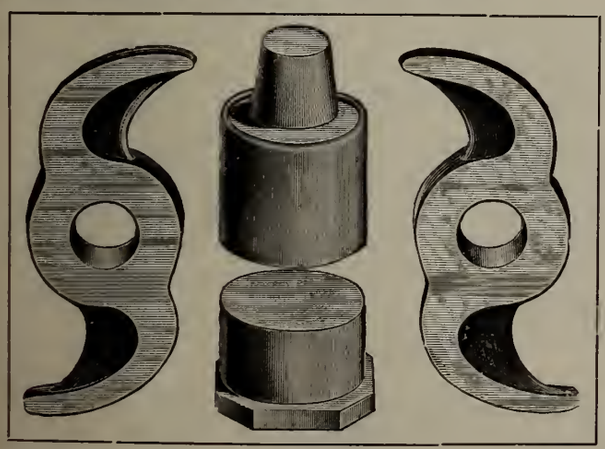

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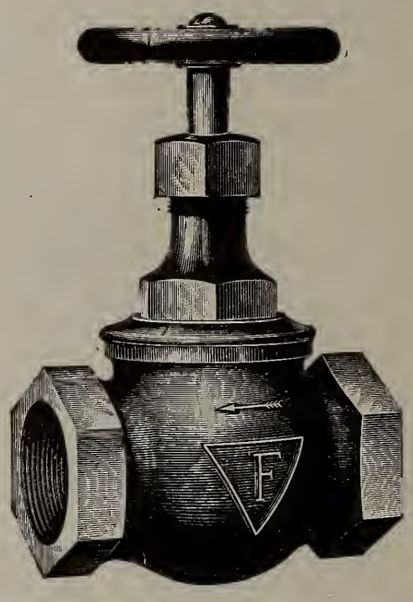

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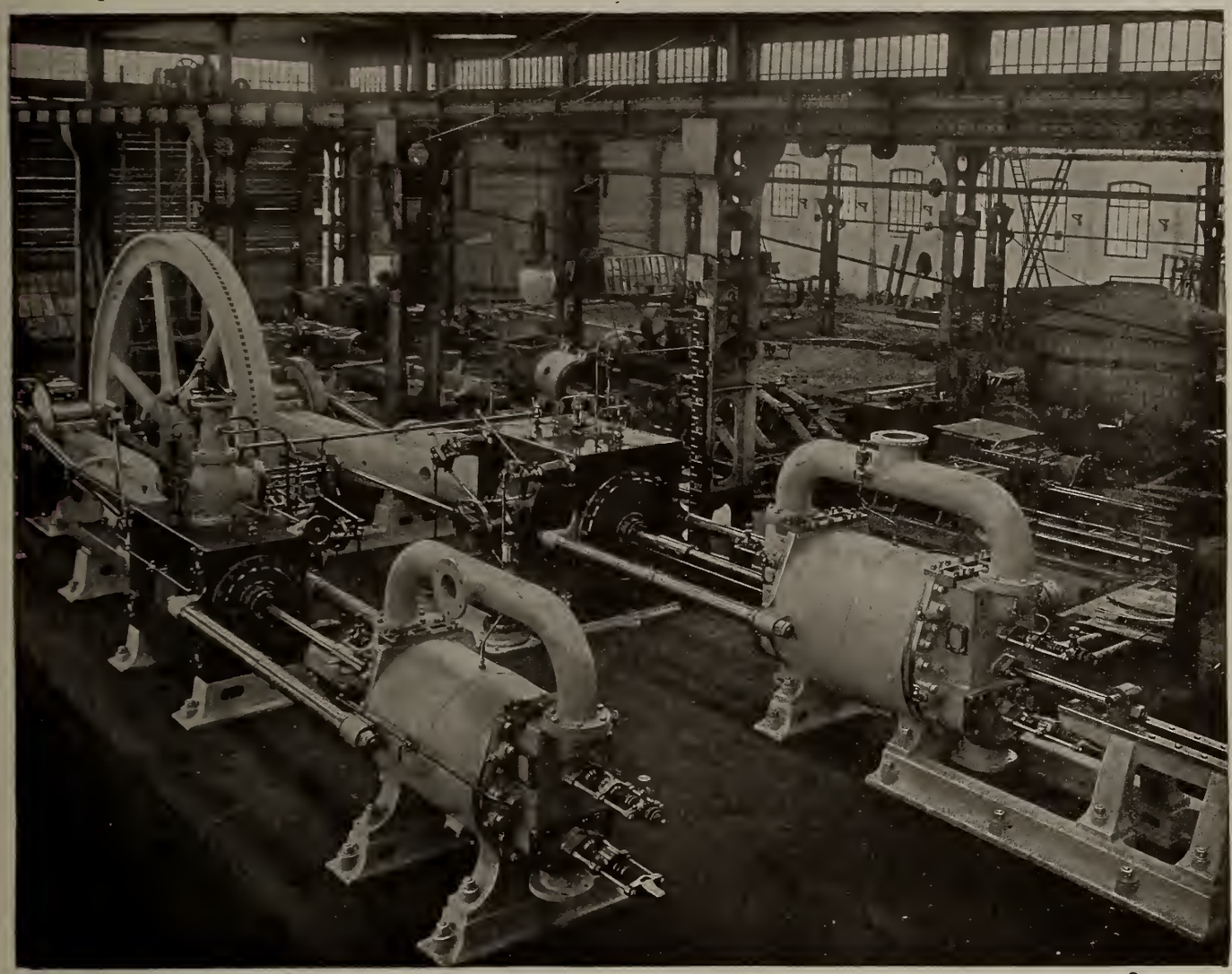

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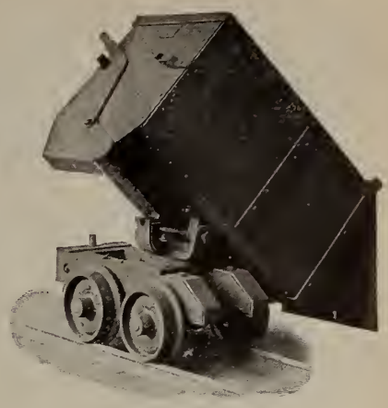

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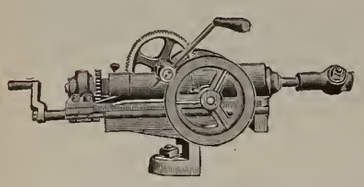

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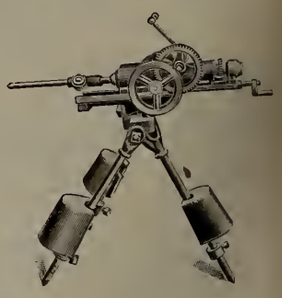

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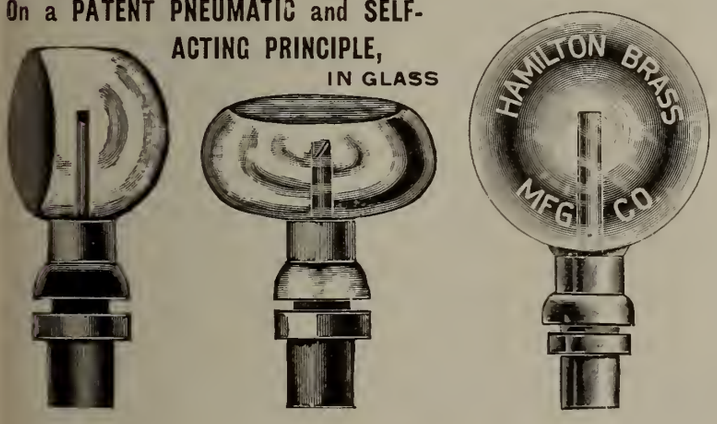

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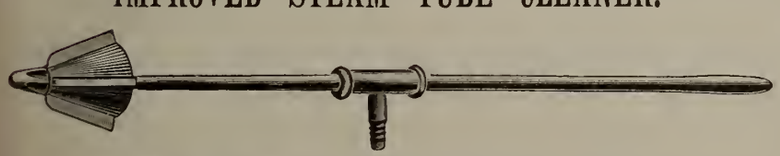

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Sample and Assay Ores and Metals.

Independent Ore Sampling Works at the Port of New York. Only two such on the Atlantic seaboard

We are not Dealers or Refiners, but Receive Consignments, Weigh, Sample and Assay them, selling to highest bidders, obtaining advances when desired, and the buyers of two continents pay the highest market price, in New York Funds, cash against our certificates.

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Various brands, for makers of Malleable Castings, for Furnace Lining and Annealing, for Mica Lubricants, for Fire-proof Paint and roofing mixtures, for paper makers, etc.

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Talismanic

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WE contract for the equipment of Complete Mining Plants, including Power Machinery. Stamp Mill Supplies carried in stock, in standard sizes, and of best material and workmanship.

A western mill Supt. writes us :—

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Write us, if you are in the market for a new mill, if you wish to enlarge your present plant, or if you need supplies, or duplicate parts of any kind. We can design and build a complete plant to suit your location, or fill your smallest order.

THE JENCKES MACHINE CO.

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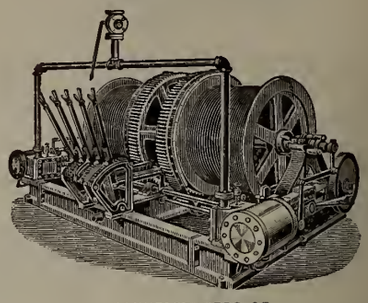

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Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS.

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Perforated metal of Steel, Copper, Brass, Zinc, for all purposes. Special attention given to

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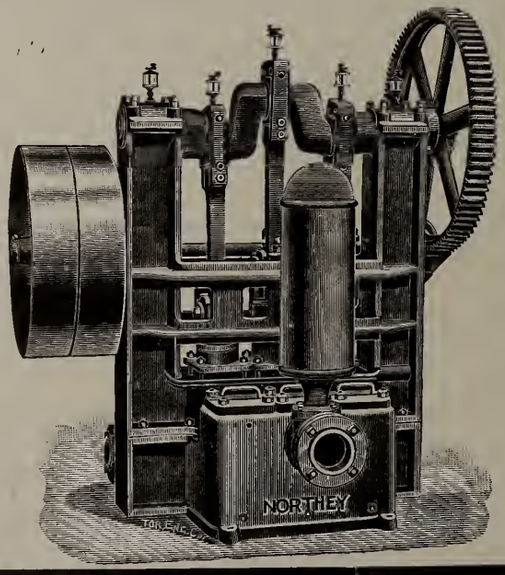
Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

THE NORTHEY CO., Limited, Toronto, Ont.

19th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 7. JULY, 1901. VOL. XX., No. 7.

The Fuel Question Again.

We feel it to be part of our duty to revert again and again to this vital problem of fuel, since the future welfare of a large portion of Canada hangs upon a solution of it. The need of solving it may not appear as strongly to many minds as it does to ours while the wave of present prosperity lasts, and perhaps there are many who do not realize that such a problem exists. The general apathy on the subject of cheap fuel for Central Canada is surprising. But, while we dislike posing as prophets of evil, we cannot avoid the conviction that when contraction of values sets in, as is inevitable sooner or later, Canadian manufacturers will be among the first to suffer, and the ability of Canada to weather the storm will depend in large part upon her ability to secure cheap fuel. Water power will in some measure sustain her industries, but not every region is blessed with such advantages, and it so happens that abundance of water power exists only at two prominent points in the centers of population close to established lines of communication in Central Canada. Furthermore, the uses of fuel for purposes other than power are so vital in many arts that water power is by no means a complete substitute. This applies with peculiar force to the iron and steel industry, gas making, cement and brick manufacture. Also the bulk of our manufactures are the products of small plants, remote from water power, and for these only cheap fuel can prevent serious hardship during a period of financial depression.

All this is so obvious that it might seem unnecessary to advance the argument, but the fact that the duty on coal still stands, and that no one earnestly takes up the cudgels against it, proves that the facts need enforcement upon public attention. The sooner a strong sentiment on this question is aroused the better will it be for Canada. The case of Ontario is bad enough even if no duty were to be paid on coal. What excuse can there be for deliberately making a bad case worse by absurd legislation?

The solution of the fuel question for Central Canada would seem to involve two things, viz., first the placing of coal on the free list, and the granting of exemption from toll on fuels passing the Welland canal, and second, the intelligent development of the peat bogs which are found from one ocean to the other.

We are aware that difficulties have attended every effort in the Western Hemisphere to place peat on the market in competition with coal. The peat bogs of the Middle Atlantic and New England States have been fitfully worked, but such enterprises have failed because of the cheapness of coal. It must be borne in mind that peat is a weak fuel as compared with coal, having an efficiency of from 40 per cent. to 50 per cent. less. This will enable coal to travel a long distance from the mines and still drive peat out of the market. No method has yet been devised by which peat may be dug, dried, and briquetted at a cost as low as that for which coal may be mined and and laid at the pit's mouth. In order to compete in this respect peat must be prepared for market at considerably less than one dollar per ton. Again, most peats are unfortunately high in ash. It is only the exceptional bog which will yield a peat containing less than ten per cent. of inert matter, which is about the average ash content of good anthracite, and where anthracite will yield about 8,000 heat units the peat will give only about 3,500 units. Furthermore, peat contains exceptionally large quantities of volatile combustible material, which occasions some serious difficulties in economical combustion under boilers. Firing in the ordinary way, with the usual draft, is out of the question. In fact we may say that it cannot be used with entire success without automatic stokers and mechanical draft. But these limitations are not so serious, especially in a country so remote from the coal fields as is Central Canada. A thoroughly up-to-date power plant using coal is in these days equipped with stokers and mechanical draft, and the pressure of competition will gradually cause all plants of even modern size to discard the old unscientific method of hand firing. If then peat can be produced at the bogs in briquette form at $1.00 per ton, allowing it to possess half the value of coal as a fuel, it can be sold at less than half the price of its competitor and still allow a good profit to the peat manufacturers.

The Peat Development Syndicate, of Toronto, has been making extensive studies of this question, and promises soon to meet the commercial conditions of the problem. Whether its method of briquetting is the best that can be devised or not we cannot say. The problem has been solved so far as to establish the business on a paying basis in Germany and Scandinavia, and while much may remain to be done in perfecting the details of briquetting, the main features of the process are worked out and well understood. Personally we incline to believe that the method of making moist briquettes, and subsequently drying these, promises to be more successful than previous drying followed by pressing. But this is after all a minor point. In one way or the other the thing can be done.

Another important matter remains to be noticed. The tendency in later years has been steadily toward the production of gas from fuels, especially from those of inferior grade, and then using the gas for steam generation, or for direct application in metallurgical processes. Owing to the high percentage of volatile combustibles in

peat this material is singularly well adopted for gas making. As a source of illuminating gas its value doubtful, though it is not proven that it may not to some extent be used to replace coal for this purpose. In the manufacture of producer gas, however, it seems indubitable that peat has a large future. For this purpose it does not need to be briquetted, so that a large cost in its preparation is saved. Experiments along this line have been making for some time, and recently a small plant has been erected at the Trent Valley Peat Fuel Works, near Kirkfield, Ont., whose operations will be watched with interest.

We sincerely hope that strenuous efforts will be made to solve the peat problem for Canada, which means the solution of a great part of the fuel difficulty, but the full solution, so far as it can be reached, will only come when the Dominion Parliament recognizes its duty in the fostering of Canadian industry by removing every tax and restriction of whatever sort from coal and coke, at all events when delivered in Central Canada.

Nova Scotia Steel & Coal Co.

The reorganization of the Nova Scotia Steel Company Limited, to which we referred in a recent issue, has now been completed and this highly successful Canadian mining and industrial enterprise will hereafter be known as the Nova Scotia Steel and Coal Company. The history of this undertaking hitherto so shrewdly and economically managed has been one of marked progress and prosperity :—

In 1872 a business was established at New Glasgow, Nova Scotia, under the name of The Nova Scotia Forge Company, for the manufacture of railway and marine forgings. The enterprise prospered, and in 1882 the proprietors decided to establish another concern to engage in the manufacture of steel. The Nova Scotia Steel Company was therefore formed to manufacture steel from imported pig iron and scrap steel, by the "Siemens-Martin Open-Hearth" process.

Seven years later, namely, in 1889, to ensure economy in working these two concerns were amalgamated as the Nova Scotia Steel and Forge Company, Limited, and extensions and additions were subsequently made to the plant. In 1891 a company was incorporated called The New Glasgow Iron, Coal and Railway Company, and built a blast furnace for making pig iron at Ferrona, near New Glasgow.

In January, 1895, the Nova Scotia Steel Company acquired the interests of the New Glasgow Iron, Coal & Railway Company and the Nova Scotia Steel and Forge Company, and carried on the business, previously conducted by these companies, until the present year. During the year 1900 the Nova Scotia Steel Company purchased as a going concern the business and property of the General Mining Association, Limited.

The General Mining Association was formed by Deed of Settlement in 1829, and (inter alia) took over the lease of the Duke of York's extensive coal areas in Nova Scotia In, or about, 1858, by arrangement with the Provincial Government of Nova Scotia, the Association released some of its rights and secured the exclusive right to all coal seams in certain areas. The leases have been renewed, and are now held under the general law of Nova Scotia. The Association had disposed of some of these coal areas before the property was purchased by the Nova Scotia Steel Company, but had retained the Sydney Mines and point Aconi Areas, which contain a superior quality of coal, with good facilities for shipment.

Owing to the acquisition of the business and property of The General Mining Association by The Nova Scotia Steel Company, additional capital is required for the development of the coal and other properties, and reorganization has been carried out in accordance with the resolution adopted at the Special General Meeting of the Shareholders of the Nova Scotia Steel Company, held on the 25th day of October, 1900.

Under the arrangement decided upon, the shareholders of the Nova Scotia Steel Company receive in payment for their property $3,090,000 of common stock and $1,030,000 of eight per cent. cumulative preferred stock in the Nova Scotia Steel and Coal Company, Limited.

This Company was organized in June 1901, with a capital of 50,000 shares of common stock of $100 each, 5,000,000 ; 20,000 shares of 8 per cent. cumulative preferred stock of $100 each, $2,000,000 ; also $2,500,000 first mortgage 6 per cent. 30 year gold bonds.

After providing for the purchase of the property of the Nova Scotia Steel Company there will remain in the treasury, for the future needs of the new company :—Common Stock, $1,910,000 ; Preferred Stock, $970,000.

The new capital required and which will be provided by the bond issue is for :—

Redemption of The Nova Scotia Steel Company's temporary loan.....	$1,500,000
Development of Coal Mines, erecting shipping pier coke ovens, coal washing plant, Furnaces, etc.....	1,000,000
	$2,500,000

The properties which will be taken over and owned by the Nova Scotia Steel and Coal Company, Limited, consist of :—

1. All the lands, shafts, buildings, plant and railways used in connection with the coal mines, together with the leases of the coal areas which were acquired by the Nova Scotia Steel Company, from The General Mining Association. These areas extend from Sydney Harbour to the entrance of the Great Bras D'Or, and comprise :—

(a) The Point Aconi and Sydney Mine areas of 11,700 acres, which contained in 1871, according to the estimate of the late Mr. Richard Brown, 155,000,000 tons of coal.

(b) The Sydney Mine submarine areas of 3,200 acres, estimated by the same authority, in 1871, to contain 66,000,000 tons of coal.

Since 1871 about 5,000,000 tons only have been worked out of the Sydney Mine and Sydney Mine Submarine areas. The Point Aconi areas have not yet been worked.

2. About 7,824 acres of Freehold Land in Cape Breton.

3. A Freehold Iron Ore Mine situated at Bell Island, Conception Bay, Newfoundland, and all deposits of Iron Ore held by the Company, in Fee simple, or by lease, in Nova Scotia.

4. Leases of coal areas, containing two coal seems of good quality now being opened up, situate within six miles of the Steel Works at Trenton.

5. A standard gauge railway, 12½ miles in length, with 3.87 miles of sidings, with rolling stock, in Pictou County, N.S.

6. About 160 acres of freehold land at Ferrona, Nova Scotia.

7. A blast furnace, Coal Washing and Coking Plant built in 1892, at Ferrona, with a capacity of 100 tons of pig iron per day.

8. About 50 acres of land at Trenton, near New Glasgow, on which are the steel works, consisting of four steel melting furnaces, together with the rolling mills, forges and other plant, capable of turning out 100 tons of finished steel a day. Over 4 acres are actually covered by buildings, and the tramways in and about the works aggregate about 4 miles in length.

9. Large limestone and dolomite properties, of excellent quality, in the County of Cape Breton.

10. Net assets represented by cash balances, book debts and stock in trade. (These amounted to $635,789.48 on the 1st day of January, 1901.)

The property of the company at Newfonndland, Cape Breton, Ferrona and New Glasgow was examined in April, 1901, by Messrs Simonds and Wainwright, mining engineers, of 159 Front Street, New

These views show the location of the gold areas and water power at Upper Seal Harbour, Stormont District, Nova Scotia, now being exploited by the Doliver Mountain Mining and Milling Company.

MR. G. J. PARTINGTON,
Upper Seal Harbour, N.S.,
Manager of The Doliver Mountain Mining and Milling Co.

MR. FREDERICK KEFFER, M.E.,
B. C. Copper Co.,
Anaconda, B.C.

MR. P. KIRKGAARD,
Canadian Gold Fields,
Deloro.

York; and the books were, at the same date, examined and audited by Messrs Marwick and Mitchell, chartered accountants, of 27 Pine street, New York, who valued the property (exclusive of the good will) at from $4,250,000 to $4,500,000.

The geographical position of Cape Breton, on the Atlantic coast of America, makes the coal deposits in this island of great value, as they are the only available deposits at tidewater on the Atlantic coast of America. The areas owned by the Company adjoin the shores of Sydney Harbour, with a coal shipping pier at North Sydney, and are, therefore, most favourably situated for shipment to Europe, South America or the East; North Sydney being 1,000 miles nearer Europe than the Uuited States coal deposits.

The Iron Ore Mine, situated at Conception Bay Newfoundland, and known as the Wabana Iron Mine, is estimated by R. E. Chambers, M.E., to contain 6,000,000 tons of red hematite ore. The average iron contents of last year's shipment of this ore to the United States was over 55 per cent. The mine is equipped for an output of over 300,000 tons during the shipping season. The shipping dock accomodates the largest class of modern steamers, with draught up to 28 feet of water, and boats of 6,000 to 7,000 tons capacity have been loaded at a rate of over 1,000 tons per hour. The situation of the property is central for export to either the United States or Europe, being six days, sailing from the principal foreign ore-receiving ports of the former, and eleven days from those of Europe. 60,000 tons of this ore have been sold for delivery during the present year at Philadelphia, and about 200,000 tons for Germany and Scotland.

The coal areas near Trenton are now being opened up, and by the close of the present year that property will supply all the coal required for steam and heating purposes at the steel works, Trenton; and in order to increase the output from the areas acquired from The General Mining Association, which during the last three years has averaged about 250,000 tons per annum, it is intended to open one or more new collieries on this property, by which it is estimated that the output will be increased to about 600,000 tons per annum.

The profits of the Nova Scotia Steel Company, Limited, for the years 1898 and 1899, as certified by the auditors, amounted to $414,586.

The profits of the General Mining Association, Limited, for the years 1898 and 1899, as certified by the auditors, amounted to $192,973.

The profits of the combined business for the year 1900, exclusive of bounties, as certified by the auditors amounted to $530,581.

This makes the profits of the combined properties exclusive of bounties for the 3 years $1,138,140, or a yearly average of $379,380.

In addition to the profits already shown, the company received by way of bounties on pig iron and steel ingots from the Government of Canada, under authority of 60 Vict., Chap 6, amended by 62-63 Vict., Chap 8 (Can.) the sum of $398,506, being a yearly average of $132,835

The total profits for the three years including bounties amounted to $1,536,646, being a yearly average of $512,215.

Unless further legislation is enacted, the bounties payable by the Government of Canada will be reduced annually after April 23rd, 1902, and will expire on June 30th, 1907.

It is estimated that the future average yearly profits will be:—

From sale of 275,000 tons of iron ore at 70 cts.		$192,500
From sale of 500,000 tons of coal at 80 cts.		400,100
From iron and steel works		150,000
Being a yearly average profit of		$742,500
Interest on bonds at 6 per cent. and sinking fund	$200,000	
Dividend on preferred stock at 8 per cent	82,400	
		$282,400
Leaving for dividends on common stock, depreciation and reserve		$460,100

Mikado Gold Mining Company.

The accounts for the year ended 31st December last show that while this well known Lake of the Woods gold mining enterprise produced bullion of a value of £21,883 7s. 1d., the net profit of the year is somewhat disappointing, being but £1,903 1s. 2d. which together with the balance forward last year of £4,599 15s. 7d. makes a total profit of £6,502 16s. 9d. which the directors recommend should be carried forward. The returns from the mill and cyanide from 1st January until 31st August (when regular crushing was suspended to admit of the new works being carried out) were 7,811 tons crushed producing 4,705 ounces of gold and from cyanide 5,194 tons, 2,410 ounces of bullion, since when (up to the end of the year) the crushings have been irregular and the results disappointing. The previous years accounts, covering two years and three months operations showed bullion receipts amounting to £38,825 16s. 9d. A reference to the following figures of the monthly mill runs and cyanide returns, kindly furnished by the management will be of interest:—

OUTPUT 1898.

January	462 ounces.
February	550 "
March	730 "
April	444 "
May	169 "
June	240 "
July	251 "
August	265 "
September	134 "
October	227 "
November	250 "
Cyanide	74 "
December	393 "
Cyanide	74 "

OUTPUT 1899.

January	407 ounces.
From Cyanide	243 "
February	316 "
Cyanide	100 "
March	236 "
Cyanide	175 "
April	334 "
Cyanide	142 "
May	313 "
Cyanide	148 "
June	288 "
Cyanide	304 "
July	372 "
Cyanide	253 "
August	451 "
Cyanide	324 "
September	557 "
Cyanide	329 "
October	657 "
Cyanide	203 "
November	658 "
Cyanide	214 "
December	691 "
Cyanide	273 "

OUTPUT 1900.

January	655 ounces.
Cyanide	299 "
February	621 "
Cyanide	179 "
March	697 "
Cyanide	221 "
April	607 "
Cyanide	287 "
May	569 "
Cyanide	288 "
June	531 "
Cyanide	413 "
July	518 "
Cyanide	403 "
August	507 "
Cyanide	320 "
October	118 "
Cyanide	210 "
November	138 "
Cyanide	108 "
December	116 "
Cyanide	50 "

ASBESTOS MINING IN QUEBEC.

Cable Derrick plant at King Bros. Mines. The thriving settlement of Thetford Mines in the background.

Interior of open-cast workings, Thetford Mines, Ont.

Mining Progress in Ontario.

The first report of the Ontario Bureau of Mines issued by Mr. T. W. Gibson since he assumed the duties of Director in succession to Mr. A. Blué has just been published, and reviews in an able and interesting manner the progress of mining enterprise in this go-ahead province during the year 1900.

It embraces very full statistics concerning each department of the mining and metallurgical industries, including the reports of the inspectors of mines, and also comprise sseveral special reports by a number of technical officers dealing with the geological characteristics of the regions containing mineral deposits which are considered to afford promising fields for operation.

Last year was one of considerable activity in mining, the more important developments being of a solid and substantial character, with considerably less of the merely speculative element that has characterized former seasons. Forty eight companies were incorporated with $35,818,999 capital, as against 74 companies with $87,382,-994 capital in 1899, and 9 outside corporations with $6,585,000 were licensed to do business. Mining lands to the extent of 30,972 acres were sold and granted, and 28,127 acres leased, the total receipts for sales, leases, etc., being $108,952.

Gold production, which has largely been on a speculative basis, has fallen off, the value of the yield being only $297,861 as compared with $424,568 for 1899. But notwithstanding this decrease and that of the production of natural gas, the total estimated value of the output of minerals has increased from $8,416,083 in 1899 to $9,298,624 in 1900, the increase being at the rate of 10 per cent. The number of workmen employed was 10,934, and had increased in nearly equal proportion, while the wages paid, amounting to $3,366,601, were 15 per cent. more.

The iron industry has made great advances. The number of iron mines in operation during the year was 12, from which the aggregate output was 90,302 tons, valued at $111,805. This is an increase of 73,391 tons and $80,854 over the yield for 1899. The number of employees had risen from 100 to 438 and the wages paid from $26,700 to$107,583. The most significant feature in connection with this expansion has been the extent to which native ore has supplanted the American product in the manufacture of pig iron at Ontario blast furnaces. The output of pig iron was 62,386 tons, the value of which, $936,066, exceeded the value of the previous year's product by $127,909. In the process, 22,887 tons of Ontario ore were consumed, being a per centage of 23 per cent. of the whole. But as an abundant supply of hematite ore from the Helen mine is now available, this proportion has since been greatly increased. According to figures for the first three months of 1901, furnished in the introduction to the report, the proportion of native ore used in Ontario blast furnaces has risen to 43 per cent. of the whole. It is altogether probable, in view of the rapid development of the Michipicoton iron mines, that before long nearly the whole of the hematite required will be supplied from this source. The number of workmen employed in the blast furnaces have been more than doubled, the force in 1900 comprising 419 men, who earned $97,915. Recent discoveries have considerably extended the area known to be iron producing, and there is reason to expect that a considerable region to the east of Lake Nepigon contains deposits which can be profitably mined.

In copper and nickel production steady progress has also been made, the principal producer of both of these metals being the Canadian Copper Co, whose operations were on a larger scale than in any previous year. The total output was as follows: 1899, nickel 2,872 tons, value $526,104; copper 2,834 tons, value $176,236; 1900, nickel 3,540 tons, value $756,626; copper 3,364 tons, value $319,681. The values given are those of the unrefined metal as exported in the form of matte. The copper and nickel mines employ 1,444 workmen, 350 of them working underground.

An important new industry, returns of which are given for the first time, is that of steel manufacture. The output amounted to 2,819 tons, valued at $46,380 Other items which have been added to the yearly increasing list of Ontario's mineral products are corundum and felspar.

The production of mica has considerably increased, the year's output being 643 tons, valued at $91,750. Cement was produced to the value of $698,015, an increase of $136,749. The value of petroleum products rose from $1,747,352 to $1,869,045, while that of natural gas was reduced from $440,904 to $392,823 owing to the exhaustion of the supply.

The report will be found very useful to prospectors, miners and capitalists interested in mining and metallurgy. It is neatly got up and very well arranged for the purpose of reference, and is handsomely illustrated.

A Lull in the Coal Trade.

Consumers of Nova Scotia coal anxiously watched the opening of trade in the spring in hopes of some reduction from the prices prevailing at the close of last year but failed to note any indications. The requirements seemingly demanded the full output and something more and spring contracts firmly maintained the rates. The call for coal has been continuous. But the month of July has seen a slackening off of the output at the mainland collieries, the first experienced for a couple of years, and several reasons have led to this condition. The miners have been working more regularly than they did last autumn and have produced more tons per man per month. More men also have gone into the coal mines. Midsummer also has a habit of being dull in demand at these pits, and then there was the large purchase of foreign coal by the Intercolonial Railway when the talk of strikes last Christmas threatened the vitality of that great consumer of fuel. Officials becoming justly alarmed laid in a supply of foreign coal and that road finds itself at the end of the financial year with some 100,000 tons of coal on hand and without contracts yet completed for the coming year. In order to profit the better by the higher prices prevailing in local markets fewer steamers in the Montreal trade were engaged out of Pictou than that port has seen for many a long year and the dullness of July's trade has resulted.

COAL MINING AND TRADE.

Our notes in last issue on the subject of the Dominion Coal Company's Annual Reports and Balance Sheet have attracted considerable attention and given rise to much discussion, the general concensus of opinion being that our criticism might have been much stronger without straining the facts of the case. Much has been said from time to time about the superiority of American over Canadian management and the absolute necessity of utilizing the former in the exploitation of Canadian mining adventures. With this view we have never sympathized for while admiting the great energy, skill, and enterprise which characterize our successful neighbors of the South, we have never believed that they enjoy a monopoly of the qualities essential to commercial success. We do not believe that the watch word "Canada for the Canadians" means the exclusion of men of merit from other countries and we certainly do not believe that it involves the depreciation of our own people to the extent indulged in by some of our leading corporations. While our American friends

have made a few notable successes in Canada, they have also registered many disastrous failures largely in consequence of their disposition to expend large sums upon costly experiments. The banks of the Dominion Coal Company, as well as others we could mention, are strewn with the wreckage of abandoned experiments and not a little of this company's enormous capital expenditure has gone in this way. Probably in this as in many other instances it is the last straw which has broken the camel's back—we refer to the sum of $179,327.51 charged on the balance sheet to Dominion No. 4, every cent of which according to the best authorities is absolutely wasted. This mine is in the Emery seam which was well tested near Reserve mine in 1893 and very properly condemned and abandoned by the present company. It was found to be a coal of good quality but uncertain thickness, the floor was fire clay which was rendered so soft by the large quantity of water in the seam that it was impossible to maintain the roads and workings. After closing down the best mine they possessed (Victoria) in a moment of foolishness they attempted to open another mine, Dominion No. 4 in the Emery seam and before ascertaining whether the conditions were any more favorable at the new site than the old they erected a most elaborate surface plant at a cost exceeding $100,000, which is now of no value whatever for the purpose intended since the Emery seam has turned out worse, if possible, in the new venture than the old, the coal having gradually diminished from five feet to two feet in thickness. The last extraordinary device, in order to prevent the entire abandonment of the plant was to put down a haulage system to convey the coal from No. 3 a distance of a mile and utilize the surface appliances at No. 4 for loading. This is indeed a remedy which is worse than the disease as it handicaps No. 3 for all time while the cost of removing the plant and setting it up at No. 3 would be repaid the first year. This is only one of many similar blunders which have helped to swell the capital account of the Dominion Coal Company to $20,801,500 and has providentially hastened the down fall of a regime which in a little while would have overwhelmed this splendid concern with irretrievable disaster. We do not for a moment suppose that with a Canadian in supreme control no mistakes will be made but we venture to think that the new management will profit by the experience of the old. The record of Mr. James Ross is a sufficient guarantee that the interesting but expensive luxury of "kite flying," will no longer be indulged in. There is already evidence of the introduction of a new element into the management, economy, and with a good year's trade, the absolute closing of capital account, and the vigorous development of recovery work this large enterprise may in a year's time find itself in a position to show a fair working profit and to produce coal at 80 cents which was the cost in 1898.

The exorbitant prices asked for coal areas in Cape Breton have effectually prevented any transactions and now it seems that the terms which same owners are seeking to attach to options are so ridiculous as to raise a doubt as to their sanity. One of the latest, which would hardly be believed if it were not stated on the authority of the "Maritime Record," is that the optionee should furnish to the owner a *daily* record of the borings. This eems too much for Senator McKeen and he has promptly declined to proceed with the negotiations. This is a pity because there is little doubt that valuable coal seams exist near the Mira within a few miles of Burkes and no one is better able to ensure their exploitation than the Senator and his associates. The easy access to large areas of good coal on the property of the Dominion Coal Company has discouraged exploration in other parts of the Island where the conditions are not as favorable, but now that the demand has so greatly increased these outlying properties will have a chance and if reasonable terms are asked there will be no difficulty in bringing them into the market. Having regard to the greater expense attendant upon recovering and transporting coals in the back lands $10,000 a square mile is the outside value of the most promising properties, and any holder of supposed coal areas would be well advised in granting an option for a reasonable time, say six months, without any deposit, on condition that a satisfactory amount would be expended in proving the property. The old argument that an optionee should pay for the luxury of proving an uncertain property belonging to some one else on the ground that the property is "tied up," is exploded, and, in our opinion, the owner gets all the best of the deal in having his property proved without cost to himself. He is sufficiently protected by the fact that the men who put up the money for this purpose cannot afford to turn it down afterwards if it is of value and they have the greatest interest in carrying through the deal.

An important and interesting meeting of the Nova Scotia Steel and Coal Company was recently held in Halifax when the new concern took over the property of the Nova Scotia Steel Company and financial arrangements were concluded for the future conduct of the business. The purchase consideration is $4,120,000 and in addition it is estimated that the company will require the sum of $2,500,000. Of this $1,000,000 is for the development of coal mines, erecting shipping pier, coke ovens, coal washing plant, furnaces, etc. It is intended to establish a new mine at Cranberry Head with a capacity of 300,000 tons a year. The estimates of the profits of the company is as follows:—

Ore, 275,000 tons at 70 cents	$192,500
Coal, 500,000 tons at 80 cents	400,000
Iron and Steel Works	150,000
	$742,500

After paying interest on bonds at the rate of 6 per cent. and on preferred stock at 8 per cent. this would leave $460,100 for dividends on common stock being nearly 10 per cent. and we should say a very moderate estimate. The whole conduct of the affairs of this company, and the business like and fair manner in which they have put their properties upon the market is deserving of note as contrasted with the outrageous figures asked for same properties of far less value, and we cordially wish them every success in their new venture.

The dispute between the C. P. R. and the Crow's Nest Coal Company does not appear likely to be settled amicably for, according to the latest advices, the former have secured from the courts an injunction restraining the latter from building a branch line up Morrissey Creek. The ground on which the application was granted is that the Crow's Nest Southern Railway Company had failed to comply with the provisions of their Charter in several important respects notably in not making the necessary cash deposit required as a guarantee for the proper carrying out of the Charter. In consequence of this injunction all railway operations have been suspended and the whole matter is to be fought out in the courts. It is not unlikely that the issue will be much wider than the mere question of a branch siding as the C. P. R. have raised a question as to the title of the Coal Company to all the property of which they became possessed in consequence of the building of the Crow's Nest line. It will be remembered that the B.C. Government many years ago made a grant of 250,000 acres of coal lands to the B.C. Southern Railway as a subsidy for building the C. N. Ry. As they failed their grant by arrangement passed to the C. P. R. when they built the line under a

Dominion Charter. As is well known the latter company agreed to transfer the bulk of this enormous subsidy to Messrs. Cox and Jaffary for political services, and they in turn formed the Crow's Nest Coal Company to carry out the provisions of their agreement. In the action which has now commenced it is alleged that the Coal Company have broken their agreement, both with the Government and the C. P. R. in such a manner and to such an extent as to disentitle them to receive the coal lands upon the terms originally provided, if at all, and as the title has never yet been transferred to them it is claimed that they should not now receive it. The important respects in which it is alleged that they have broken their agreement are: 1st in failing to supply the requirements of the Province; 2nd in charging the B.C. consumers a higher price than stipulated in the Charter; and 3rd that not having made their selection of coal areas within the stipulated time they are not now entitled to do so. What the outcome may be it is impossible to say, but it will be observed that these allegations are upon lines repeatedly canvassed in these columns and that they raise for the decision of the courts matter of vital importance to all parties concerned as well as to the interest of the Province.

The Collin's Process of Heating and Drying Compressed Air.

By E. J. Walsh, C.E., Lake Temiscamingue, Que.

A patent embodying all that the above specifies, and entitled a "Process of Heating and Drying Compressed Air," has recently been granted by the Canadian Patent Office, to John J. Collins, and Edmund J. Walsh of the city of Ottawa, the former being the discoverer, and the latter an interested party in the invention.

The discovery made by Mr. Collins is of the most important nature, is based on thoroughly scientific principles, and by its application the use of Compressed Air, Liquid Air, and Air power in all its various forms will be rendered so complete, as to revolutionize the economic application of all natural forces whether utilized for driving stationary machinery, moving trains, operating street railway systems, navigating the oceans, rivers and lakes, cooling and ventilating, and for every purpose for which power, other than manual labour, is desired.

Compressed Air is one of the most valuable, and most economical powers in use to-day, and while it has been largely used hitherto, its general application, in preference to other forces, has been somewhat curtailed in view of the fact that serious difficulties have arisen in the use of it at an atmospheric temperature of 40° Farenheit, or lower, on account of the freezing of certain essential portions of machinery which are necessary for utilizing this power. The inventor having been associated with various large undertakings on this continent where Compressed Air plant had been installed, but which in every instance had been rendered useless for several months in each year, by reason of the freezing, as referred to above, applied his energies to overcome those difficulties, with the result that his efforts have been crowned with success, and the use of Compressed Air, in any form, is now available in all latitudes, all altitudes, and at any degrees of temperature. I can personally vouch for this, as Mr. Collin's process was adopted at the mine of the British and Canadian Lead Company, Limited, at Lake Temiscamingue, Quebec, in November, 1900, and has constantly been in use since.

The temperature during the past winter has frequently been as low as 40° below zero, yet not the slightest difficulty was experienced in operating the machine drills, the hoist engine, and the mine pump by Compressed Air. Previous to this we were unable to operate the hoist engine by Compressed Air, and had to use steam for the purpose, even difficulties were experienced in operating the mine pump. I tried various means to overcome the freezing of the air, and consulted several manufacturers of Compressed Air Machinery, on the subject, and while some advised the adoption of various expedients, yet none were positive as to their efficacy. Being aware that the difficulty regarding the freezing of Compressed Air in operating machinery had always existed, I was unwilling to incur any expense in experimenting, but when Mr. Collins placed his proposition before me, and satisfied me that he could put in his process without any expense I readily acquiesced, and he applied it while the hoist was still in operation, increasing its power in effectiveness, and also enabling us to largely reduce expenses in the matter of fuel and wages.

This discovery will place Compressed Air in the forefront of all physical forces, whether used as a power, or for ventilating, and there can be no question but that its adoption will become universal in a very short time.

EN PASSANT.

We regret to learn of the death in Arizona of Mr. Lionel H. Shirley, C.E., an engineer who has been familiar in Eastern Canadian railway and mining circles for many years. Mr. Shirley will perhaps be remembered by many of our readers as the engineer who opened the celebrated Villeneuve Mica Mine away back in 1885-6.

Professor Courtenay De Kalb who, for a number of years has ably fulfilled the position of Inspector of Mines in Ontario in conjunction with that of Lecturer in Mining and Metallurgy at the Mining School at Kingston, has resigned and will go into professional practice on his own account in Boston. Mr. De Kalb's services to the Government and mining industry of Ontario have been of the greatest possible value, and to him, more than any other, has been due the marked elevation of the status of the Kingston School to a practical training college for Canadian mining engineers.

Volume IV. of the Journal of the Canadian Mining Institute is rapidly nearing completion and should be in the hands of the members by the end of August. It will be a handsome volume of close upon 400 pp. profusely illustrated with line and half tone engravings illustrating the text.

Sufficient funds having been subscribed to meet the expense of painting the Dawson and Selwyn portraits, this fund is now closed. The portraits, which have been admirably executed by Mr. Franklyn Brownell, the Canadian artist, will be formally presented to the Survey sometime in the fall when the members of the staff return to Ottawa from their season's operations in the field.

It is not unlikely that both the Canadian Mining Institute and the Mining Society of Nova Scotia will hold meetings in September. The Institute contemplates a visit first to the Sudbury nickel and copper mines, thence on to Sault Ste. Marie for an inspection of the great copper and iron and steel industries at that point, returning by way of Central Ontario where a stop of several days' duration will be made to permit the members to see the mines and works of the Canadian Gold Fields, the Cordova Exploration, the Atlas Arsenic Company, and other features of this unusually interesting mining section. The proposed excursion, it is expected, will occupy at least ten days. The Mining Society's meeting will, as usual, be held in Halifax.

Mr. Charles Fergie, M.E., President of the Canadian Mining Institute, has returned to Nova Scotia, from a well earned holiday in the old country.

THE LATE MR. JAMES F. LEWIS,
PRESIDENT CANADIAN RAND DRILL CO., SHERBROOKE, QUE.,
Died 23rd July, 1901. Age 61 years.

The present number of the REVIEW had been made up and printed before the intelligence reached us of the death of our dear old friend "Jim" Lewis, and we have only time at this writing to merely chronicle the sad event. He had been ailing for some time and was on his way South with his family, when, at Boston, his illness took a serious turn and, after much sufferings he passed away on Tuesday, the 23rd instant. Mr Lewis was widely known and immensely popular among mining people in the United States and Canada. As president of the Canadian Rand Drill Company he came to Canada a few years ago to direct the affairs of the large establishment of that company at Sherbrooke, Que. He was for a number of years an officer of the American Institute of Mining Engineers and during the memorable visit to America of the Iron and Steel Institute he rendered conspicuous service as the successful organizer of one of the most arduous portions of that remarkable programme. He was also a Vice-President of The Canadian Mining Institute among whose members he was a great favorite. Less than a year ago he was the life of the party which visited Cape Breton, and at the succeeding March meetings he took, as usual, a foremost part in contributing to their success. In his death we lament the loss of a warm personal friend.

The West Gore Antimony Deposits.

By Mr. W. R. Askwith, Halifax.

Through the courtesy of Mr. Alex. McNeil, the writer is enabled to give this brief description of the West Gore antimony deposits of Hants County, Nova Scotia.

In the year 1880, float antimony ore was found by John McDougal on his own farm, and trenching was commenced with the view of discovering its source, but owing to the idea that the vein would run parallel with the strike of the country rock considerable work was done before the outcrop of the vein was reached.

During the years from 1880 to 1892 the mine was worked with varying success, and under a number of managements, when it was closed down, and remained so until the present owner acquired the property about two years ago, and since then considerable prospecting work has been done.

About 1,100 feet from the McDougal discovery, in a south-westerly direction, another vein of this same ore was found by Gould Northup in 1887.

The North and South veins as they have been called, each have the same course, dip, and general characteristics, but as it was from the north vein that the large proportion of ore was obtained, the writer will confine himself almost entirely to it in this description.

The north vein is a true fissure vein; it has a course N. 45° W. and a dip to the S.W. averaging 85° from the horizontal, and has been traced upon the surface for over 1200 feet. The jumbled up slate, calcite and quartz which constitutes the vein filling is cut by numbers of small quartz stringers from the footwall side. This footwall is irregular and indistinct, but the hanging wall is always clear cut and smooth. The country rock is make up of grey slates and quartzite, which have a strike almost east and west, and a dip of 45° from the horizontal, towards the south, and no faulting has occurred since the vein was formed.

The ore as a rule clings closely to the hanging wall, but in one or two places it splits in two and one part follows the hanging wall and the other the foot wall, while at times it will break entirely away from either and follow the centre of the vein.

The ore is stibnite, solid some times, and then again is mixed with quartz. Where the stibnite has been exposed it has oxidized into the orange-colored kermesite and the white valentinite, but these oxides are in very small quantity and only as a thin coating over the solid ore. Sometimes the stibnite is replaced by iron pyrites, arsenical iron pyrites and galena. More or less gold is always found in the ore, and seems as a rule to be richest in that metal when the percentage of stibnite is high. With the exception of where a cross vein of quartz comes into the vein at No. 1 shaft, none of the gold is free, even in ore assaying as high as 10 oz. gold to the ton.

The ore has varied in size from a few inches to 7 feet, and in its widest place has been solid stibnite. The ore chute has an average dip of 45° to the south-east.

No attempt will be made to give any history of the development, but a glance at the plan and sections will show what has been accomplished.

It will be seen that a great many shafts have been sunk on the vein, but the one now called No. 3 was the first deep shaft put down (the outcrop was a little to the west of this), and reached a depth of 170 feet. No. 2 shaft, 220 feet to the eastward, was sunk to a depth of 170 feet, but has since been extended another 70 feet. No. 1 shaft, vertical for 240 feet, with its cross cut to the vein and crooked winze shaft of 188 feet, was the last sunk and is situated 156 feet east of No. 2 shaft; besides these, four shafts from 20 to 40 feet deep have been sunk on the vein east of the Rawdon road, and two more west of No. 3 shaft; in these, except in No. 4 shaft, the ore was very low grade, but they demonstrate the great strength and continuity of the vein.

The amount of ground stoped is estimated roughly at 76,000 square feet of the vein, and this no doubt is the outside limit, for no account is taken of a little low grade ore which is left in the stopes as pillars and in other places, for the writer is informed that only ore carrying 50 per cent. of antimony and over was marketable. Of course some of the second class ore was sorted up to the standard. From the above amount of ground stoped there has been shipped, according to the export returns of the Customs Department, 3,121 tons, and since the present owner secured the property they have shipped 1,236 tons of second class ore from the dump.—550 tons of this were sold to "The Antimony Gold and Complex Ores Extraction Company," sampled and assayed by Claudet, of London, assayers to the Bank of England, etc., and gave 12 per cent. antimony and 18 dwt. in gold—686 tons were bought by the St. Helen's Metal Recovery Company, and sampled and assayed by Messrs. Harrington & Co., and gave 11.83 per cent. of antimony.

From the many assays made of the high grade ore, it is safe to say that the 3,000 tons shipped previous to 1892 averaged between two and three ounces of gold per ton. For a long time it was not known that the ore contained any gold, and when it was discovered the smelters refused to give any value for it.

The greater demand for antimony ore has increased the price, and the improved metallurgical processes have not only made possible the utilization of a much lower grade ore, but have enabled the smelters to pay for a considerable proportion of the gold.

The St. Helen's Metal Recovery Company after putting up a trial plant and proving it successful are erecting works to treat 600 tons a month, and will not only buy ore as low as 12 per cent. antimony at regular market prices, but expect to be able to pay for 75 per cent. of the gold contents.

There are several thousand tons of this second class ore in the mine to-day not stoped, besides large quantities are said to be lying on the scaffolds, which, at the time operations were carried on, it did not pay to hoist to the surface.

The following list of assays will show the value of the second-class ore, but it must be borne in mind that all of the high grade ore was gouged out before the mine was closed down, and that greater depth will have to be obtained before any more high grade ore can be mined. The numerals ranging from 1 to 21 on the longitudinal section indicate from where the samples were taken, and it may here be noted that samples were large, and that every care was exercised to make them an average.

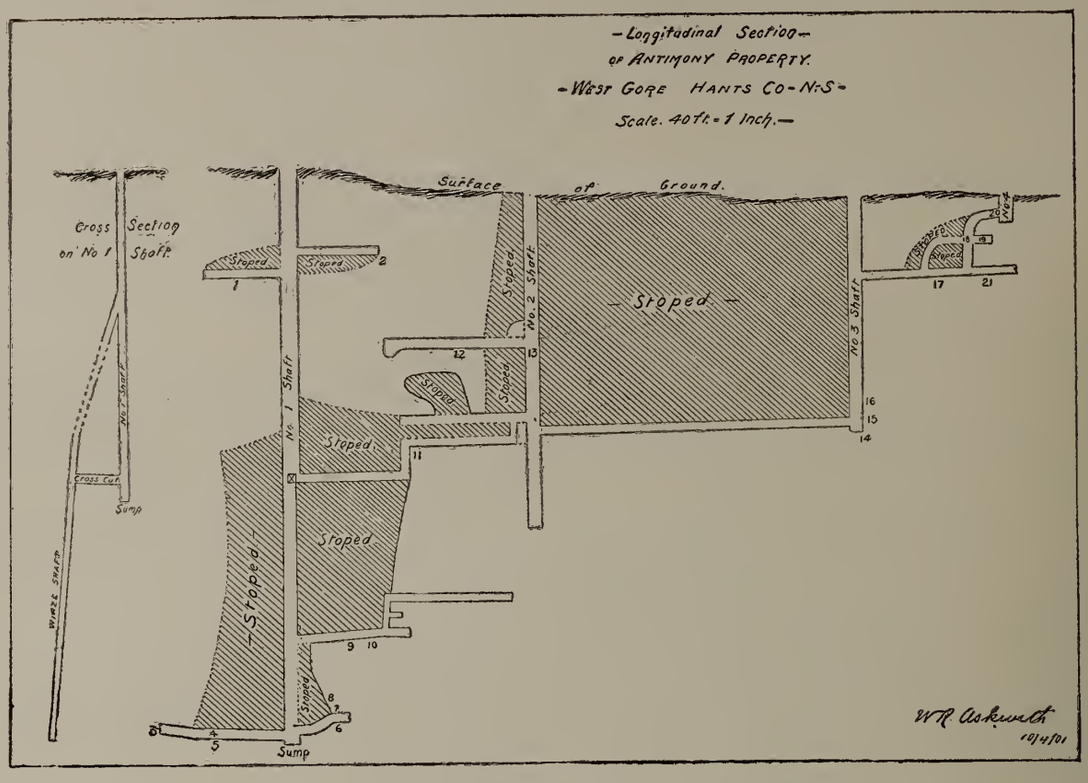
No.	% of Sb.	Value of Gold.	Thickness of Ore	Remarks.
1	5.50	$26.00	12 inches	
2	10.50	30.00	6 "	
4	4.95	3.60	6 "	
5	41.13	186.00	24 "	
7	1.14	14.65	24 "	
10	33.00	35.40	6 "	
12	9.90	21.32	9 "	
13	7.26	1.50	— "	
15	21.80	8.00	8 "	
16	5.37	8.00	12 "	
18	13.64	37.30	4 "	Foot wall ore.
19	28.60	80.00	4 "	Hanging wall ore.
20	0.18	58.00	— "	A greenish slate.

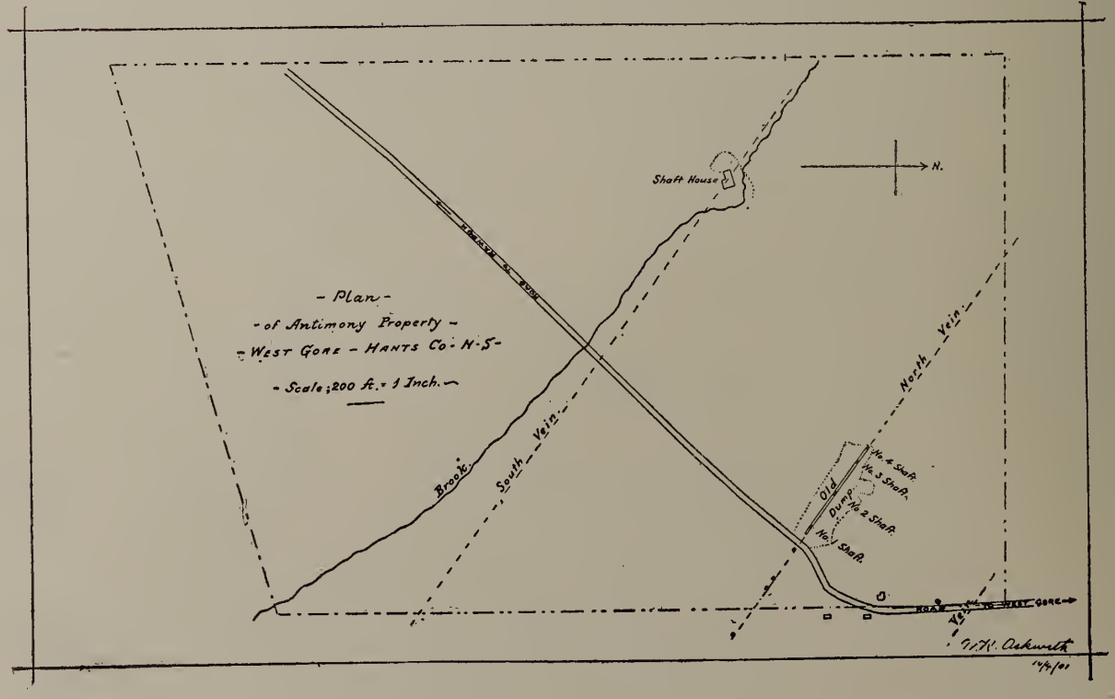
Note.—The Gold value is based on 2,000 lbs. to the ton.

A very conservative estimate of the second class ore left in the vein will give it an average thickness of 6 inches—containing 12 per cent. antimony and $23.00 in gold to the ton of 2240 lbs.

According to the miners who worked in the mine during the whole period of operations the ore stoped averaged one foot in thickness, and

WEST GORE ANTIMONY DEPOSITS.





it coincides with the writers calculations. This stoped ground is the high-grade ore chute, and it is practically worked out down to the bottom of No. 1 shaft.

Samples were also taken of the slate and soft vein material; care was taken that no ore would get into the sample, and these assayed as follows:—

No.	% of Sb.	Gold Values.	
3	0.20	$0.50	
8	Trace	2.00	
9	"	0.50	Gold values estimated at 2,000 lbs.=1 ton.
11	1.76	2.80	
17	0.15	Nil	
21	Trace	Trace	

South Vein—Assays of high grade ore from the south vein gave 60.29 per cent. antimony and 2.66 oz. gold per ton of 2,000 lbs., and a second class ore 5.27 per cent. antimony and 1.38 oz. gold per ton of 2,000 lbs.

Five tons of ore assaying 56.96 per cent. antimony and 25 tons assaying 12 per cent. antimony were shipped from this vein to the St. Helen's Metal Recovery Company.

A shaft has been sunk on the south vein 105 feet.

Another vein of stibnite ore was found by John McDougal a couple of years ago about 700 feet north-east of his original find. There has been found at times rich float ore on a hill situated between the north and south veins, and which it does not seem possible could have come from either of these veins.

A mile to the south-east of the West Gore mine, and in range with the direction of the course of the vein, a ton or more of antimony ore was picked up, but so far its source has never been successfully traced.

Float antimony ore is also found to the north-west of the mine.

Now that the Midland Ry. passes through the district affording cheap transportation facilities, and that the market for this class of ore is so much better than it ever was before, the writer thinks some of the Nova Scotia prospectors should turn their attention to this most promising field.

Potters Clay at Middle Musquodoboit.

By Mr. F. H. Mason, Halifax.

(Paper read before the Mining Society of Nova Scotia.)

A sample of what appeared to be true china clay was brought to my office by a prospector last summer, who informed me that there were millions of tons of it. The clay was very unctuous to the touch, slightly off color, due to organic matter, and burned to a dead white in both oxidizing and reducing atmospheres. It stood the highest temperature I could give it in the wind furnace, without showing signs of even incipient fusion on sharpened edges.

An analysis of it showed it to be composed of:—

Silica	50.90
Alumina	37.30
Oxide of iron	trace
Lime	nil
Fixed alkalies	0.65
Loss on ignition	11.19

This analysis corresponds to the best Cornish and Chinese Clays, as will be seen by the following analysis given by Thrope in his dictionary of chemical technology:—

	Chinese.	Cornish.
Silica	50.5	46.32
Alumina	33.7	39.74
Oxide of iron	1.8	0.27
Lime	nil	0.36
Magnesia	0.9	0.44
Fixed alkalies	1.9	12.67
Water	11.2	

Satisfactory terms being arranged as to prices, and a working option being given, I started for Middle Musquodoboit with ideas of untold wealth swimming in my head, and, armed with a tool made like a large cheese scoop, to which could be attached steam piping, thus enabling me to penetrate 30 feet into the ground. On arrival I found that the white clay cropped to the surface at intervals over a distance of 1,000 feet in a valley, or interval, between two and three hundred feet wide.

The first bore hole, however, scattered my ideas of untold wealth; the result was 4 feet 6 inches white clay, then 2 feet of micaceous sand, in which occurred fair sized pieces of iron pyrites, then 11 feet 6 inches of mottled clay, palpably containing too much iron to be any good as a fire clay, at the end of which we dropped the piece of wood which was used for driving the core out of the borer down the hold, and, after unsuccessful efforts to recover it, abandoned the hole. The next hole, some 600 feet higher up stream, gave 6 feet white clay, followed by 12 feet mottled clay.

Another hole, 100 feet away from the last, gave 1 foot white, 7 feet mottled, then 17 feet of white, which was the extent of piping I had with me.

Another hole put down at the bottom of a shaft sunk through 10 feet of surface alluvium, gave 22 feet of white clay.

It is not necessory to go through details of all the shafts sunk and bore holes put down, the accompanying plan shows this clearly.

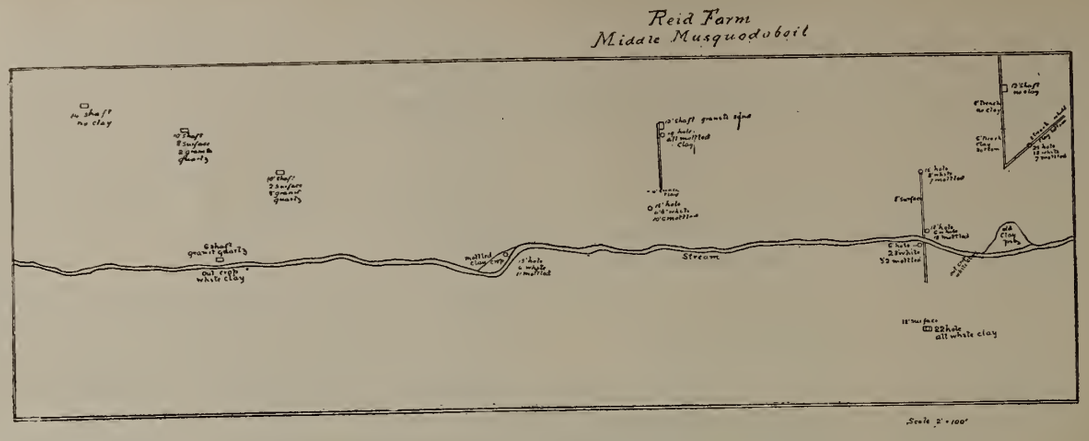
The conclusions I arrived at from the prospecting done were: That there is undoubtedly a large body of clay at this point; that it is formed from the decomposition of granite is clearly proved by the presence of of granite quartz at several places in the interval; that at the time the clay was deposited pieces of pyrite were deposited with it. These have since become oxidized, forming oxide of iron and sulphuric acid, the latter being leached out, leaving the oxide of iron. It will be noticed by carefully examining the mottled samples that the mottling appears to radiate from centres, the latter being composed of pure oxide of iron; that the clay bed does not lie evenly at a given distance from the surface, but appears to undulate. This may be due either to movement since its deposition or to the action of streams, the courses of which have since altered.

Analysis of the borings were made by cutting V-shaped pieces out of each section of the core, giving the following results:—

	Average sample white clay from 18 ft. bore hole.	Average sample mottled clay from 15 ft. bore hole.	Floated mottled clay	Floated white clay.
Silica	53.20	63.91	52.90	53.00
Alumina	30.25	18.60	29.00	32.10
Oxide of iron	1.72	5.75	3.20	1.70
Lime	Nil	Trace	*....	Nil
Magnesia	Trace	Trace	*....	Trace
Alkalies	1.33	*....	*....	0.97
Loss on ignition	12.00	20.30	12.10	12.20
Titanic oxide	1.47	*....	*....	†....

* Not determined. † Not estimated.

With regard to the analyses, they were made by what is known as the sulphuric acid method. The alkalies were determined by evaporation with hydrofluoric acid and a little sulphuric acid. Titanium was estimated in the residue and in the precipitate formed by adding ammonia to the solution. The traces of lime were removed with ammonium oxalate, and the solution evaporated to dryness, and the alkalies weighed as sulphates. In the cases where titanium oxide were not estimated, it would be determined with the silica, and a little may possibly come through and be determined with the iron. The iron in



Potters Clay at Middle Musquodoboit, Nova Scotia.

all cases was calculated as ferric oxide, although some of it is ferrous oxide.

Just exactly what part titanium plays in a fire clay is rather a disputed point. I am inclined, however, from experience with this clay, to the opinion that it acts as a base to the silicia.

From the analysis of this clay, it should stand fire. That it did not do so is a matter of fact.

Col. W. C. Trotter, of the Standard Drain Pipe Co., of St. John's P.Q., kindly undertook to make some bricks for me and have them tested in the heat of the blast furnace, with the result that it was cut up in 24 hours. The brick was made with the addition of 25 per cent. of silica sand.

His opinion of the clay is interesting, and I will quote from his letter to me :

"The clay is good, and as I mixed it (25 per cent. silica sand) will make a good ordinary fire brick, but will not stand for blast furnaces or cupola purposes, although it is quite possible that further experimenting with different mixtures of clays in the bank, together with judicious mixture of gray or silica sand, or both, would produce a good brick." . . . "The clay works well, and should be treated on the semi-dry process. Its shrinkage at 2,500 deg. F. is 7/8 inch to the foot with 25 per cent. silica sand, and 1/8 inch to the foot pure.

The result of this test, together with a 14-mile haul, was hardly sufficiently encouraging to prosecute further development.

Should, however, the long-promised railway ever penetrate Middle Musquodoboit, it might be worth further investigation.

For the manufacture of pottery, for a high grade building brick and for pipe-clay it would undoubtedly be excellent."

Gold Dredging in New South Wales.

(From *Mineral Resources of N.S.W.*)

It has already been stated that the beds of many of our running streams contain gold in their gravels, and there is reason to believe that, in a number of instances, these deposits are richer than the Tertiary or Pleistocene drifts. Many rivers were continually changing their courses, and in doing so they cut through the older deposits of auriferous drift, and, acting as natural sluices, they concentrate in their beds the gold washed from these older deposits. Again, in many of our river valleys older auriferous drifts occur at considerable elevations above the bed of the present stream, marking the positions which the river bed occupied in Tertiary or Pleistocene times. The older drifts have been continuously subjected, since their deposition, to the destructive operations of the atmosphere, and their gold contents have for long periods, been washed down the sides of the valley by rain and running water into the stream below, where they have been naturally sluiced or concentrated by the action of the water. Not only has this action been going on for many centuries but it is in operation at the present time; and every creek which finds its way through auriferous country to a river, may be regarded as contributing its quota to the enrichment of the gravels in the river bed. In view of these considerations, it is not difficult to believe that some of our existing rivers, confined as they are to much narrower channels than were the ancient rivers, and receiving the drainage of wide areas of auriferous country, should contain in their beds extremely rich deposits of gold. Miners, generally, are thoroughly alive to the conclusions just mentioned; but it is, as a rule, extremely difficult for them to extract the gold from the gravels in the beds of the river, on account of the presence of such large bodies of water. In exceptionally dry seasons it is possible to work portions of such deposits, and this has been done in a number of instances with considerable profit, the gravels being removed and treated in ground sluices. Again, in some cases, it is possible to divert a stream to one side of the valley by means of a dam, and then extract the gold from that portion of the gravel from which the running water has been excluded. Where a river makes a horseshoe bend, again it is frequently practicable to drain the bend by making an open cutting, or a tunnel, across the neck or narrowest part of the enclosed land, and thus divert the water. Still the fact remains that it has been impracticable in many cases to extract, by ordinary methods, the gold which is believed to exist in our river beds.

In New Zealand the difficulty has been solved by the introduction of gold dredges. The industry of gold dredging has been in existence in that colony for some years; but great improvements have recently been made in the appliances used, with the result that enormous profits are now being obtained, and the method has been demonstrated to be the most economical for saving gold hitherto practiced in the world. Gravels, containing at the rate of only one grain of gold per cubic yard, have been made to yield handsome profits, and so efficient is the machinery for the saving of extremely fine gold, that a hundred of the small particles of gold recovered by a dredge were found to weigh, in the aggregate, only .097 grains; their average weight was, therefore, slightly less than one-thousandth of a grain.*

A special pamphlet on the subject of gold dredging, written by Mr. J. B. Jaquet, geological surveyor, was published by the Mines Department of New South Wales, in 1898, and has been the means of directing a considerable amount of attention to the question of the successful working of the river beds of this colony. The following is an outline of the process:—

The dredge consists of a strongly built pontoon, having an open

*New Zealand Mining Journal, 1st September, 1897, p. 296.

well-hole extending down its centre for about two-thirds of its length. Over the inner, or rear, end of this well-hole is pivoted one extremity of a beam, called a "ladder," which is furnished with rollers at each end, over which revolves an endless band, having buckets attached to it at intervals. The free, or forward, end of the ladder can be raised or lowered at will, by ropes and pulleys, suspended from a frame, called a gantry, fixed in the bows of the pontoon; and, by means of this gear, the buckets can be made to excavate gravel at any depth down to about forty feet below the surface of the water. The endless belt, carrying the buckets, is caused to revolve on its rollers by a steam engine. At intervals on the belt one of the buckets is replaced by a grab, for the purpose of catching up very large boulders. Just abaft the pivoted end of the ladder, and extending lengthwise towards the stern of the pontoon, is placed a cylindrical trommel, or revolving screen, which is slightly inclined from the horizontal. The perforations in this screen increase in size towards its lower end, where they measure about half an inch in diameter. The gravel, as it is brought up by the buckets, is discharged through a shoot into the trommel, where it meets a strong spray of water issuing from a perforated pipe. As the trommel revolves, the finer material, carrying the gold, is washed through the perforations and falls upon inclined tables, while the coarser portions of the gravel, including the large boulders, pass through the inclined cylindrical trommel, and are raised by an elevator and discharged in the rear of the dredge. As the ejected material occupies a larger space than the gravel did before it was excavated, the elevator is so arranged that it can deliver the waste material at the top of a heap from twenty feet to forty feet high, if necessary. Briefly stated, the method involves the excavation of the auriferous drift from the front of the dredge, and the stacking of the tailings, or waste material, at the stern. The inclined tables, upon which the finer material with the gold falls, after issuing from the perforations of the trommel, are covered with cocoanut matting and upon the top of this is laid either wire netting or a plate of what is termed "expanded metal." This consists of wrought iron, perforated with slots, one side of each slot being raised slightly. These form riffles, and serve the purpose of catching the grains of gold. The tailings from the tables pass into a launder, by which they are conveyed to the stern of the dredge. The cocoanut matting from the first table is rinsed in a box of water every night, and those from the other tables are washed once a week, for the purpose of collecting the concentrates. The washings or concentrates are then treated in what is termed a "streaming-down box," in which the gold is finally separated from the last traces of the worthless material.

The dredge is moored by five wire ropes, viz., two on the port side, two on the starboard side, and one (head-line) from the bows. The outer ends of these ropes are firmly attached to stout planks buried in the soil. The inner ends pass round pulleys fixed on the deck of the dredge, and are attached to the barrels of steam winches, so that, by means of the winches, the dredge can be moved laterally, in either direction, or forwards, as desired.

The dredge is capable of cutting a channel for itself into the bank of a river, aud thus letting in the water necessary to keep it afloat; and as many rivers are bordered on either side by wide alluvial flats, which have been formed by the stream changing its course from time to time, the whole width of these flats can be dredged down to the bed-rock, and the gold recovered. The dredge can also be launched in a hole, excavated by manual labour, in one of these alluvial flats; and as the draught of a large dredge is only about 3 feet 6 inches, sufficient water will generally drain into the excavation from the surrounding gravels to keep her afloat.

The dredge works three (eight-hour) shifts per day, and requires a crew of six men, besides a master; the latter, however, may superintend the work of several dredges. Two men are required for each shift. One of these attends to the steam winches, and gives the dredge a slight lateral travel whenever he sees the buckets begin to come up empty; the second man attends to the engine, and acts as stoker. The remainder of the work is entirely automatic.

With regard to the success of the dredging industry in New Zealand, Mr. Jaquet mentions one instance where a dredge, which cost £5,000 to build, obtained more than sufficient gold to pay for itself within seven weeks after starting work. Another small dredge obtained £3,570 worth of gold as the result of two months' work. A third, belonging to the Clyde Dredging Company, Limited, recovered gold to the value of £10,156 for nine months's work. In this last instance the capital of the company was only £4,000.

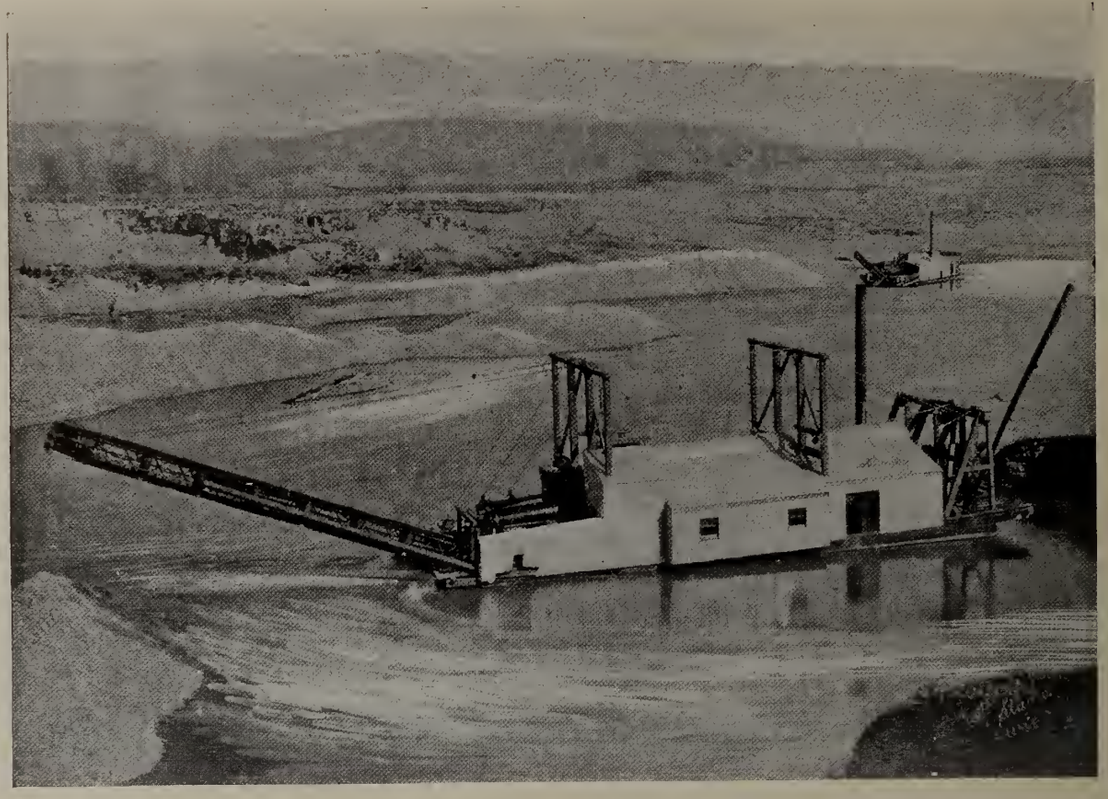
The principal question of interest, so far as the colony of New South Wales is concerned, is whether the conditions under which the auriferous gravels occur in our rivers are favourable to the employment of dredges? It has been contended by some persons that dredging cannot be successfully carried out in this colony on account of the uneven nature of the slate bottom which characterizes many of the rivers, and which would prevent any gold lying in crevices from being recovered by the buckets. There is no doubt that the New Zealand rivers (the Clutha and its tributaries) are exceptionally favourable for dredging, by reason of the general character of their bed-rock, their depth of water, and the enormous extent of their alluvial flats, The New South Wales rivers may not possess so many advantages in these respects; nevertheless, successful results have already been obtained in a number of cases, and it is hoped that any difficulties that may arise in the future will be overcome. In regard to this question, Mr. Jaquet remarks:—*

"It is necessary, however, that one should be very cautious in expressing an opinion as to whether a river bottom is adopted for dredging or otherwise. Indeed, when the drift deposits extend to a great depth, this question can only be satisfactorily answered after prospecting operations have been carried out. In several places upon the Clutha the same schists, which appear hard and unyielding upon the bank, have been found to be soft and pliable beneath the river. In working upon flats, or in shallow, sluggish rivers—and the majority of our New South Wales rivers are of this character,—it may be possible to dredge close down to the bottom and finally clean the same with the aid of divers. For the purpose of raising a small quantity of gravel which the buckets were unabie to reach, and for cleaning out the crevices, sand-pumps, controlled by the divers, might, perhaps, be used with advantage. The rapid current would render it dangerous to employ divers on the Clutha.

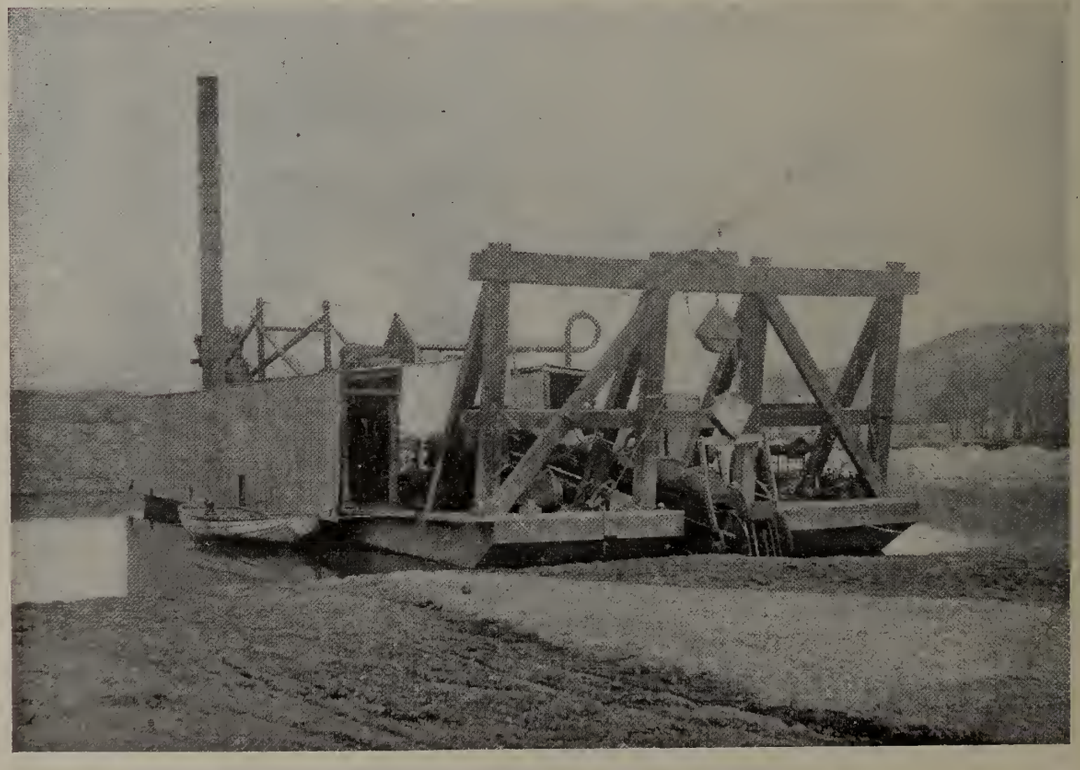
"In this connection it is important to note that the gold, in many river drifts, is not confined to the bottom, but is more or less evenly distributed through a considerable thickness of gravel, or a portion of it may have been deposited upon a false bottom at some distance above the bed-rock. While prospecting the auriferous gravels upon the Sholhaven River in 1893, I obtained, in many instances, a higher yield of gold from a false bottom than from the bed-rock below, and several beds of gravel were tested in which no concentration of the precious metal upon the bottom could be detected. It is obvious that, under such circumstances, dredging might be profitably carried on, notwithstanding the presence of a hard, rough bottom.

"Another impediment to the industry is to be found in the occurrence of decaying logs or tree stumps. The Clutha is practically free from these obstacles, but they have given considerable trouble to the

*Mineral Resources, No. 3: Notes on Gold Dredging, 1898, p. 15.

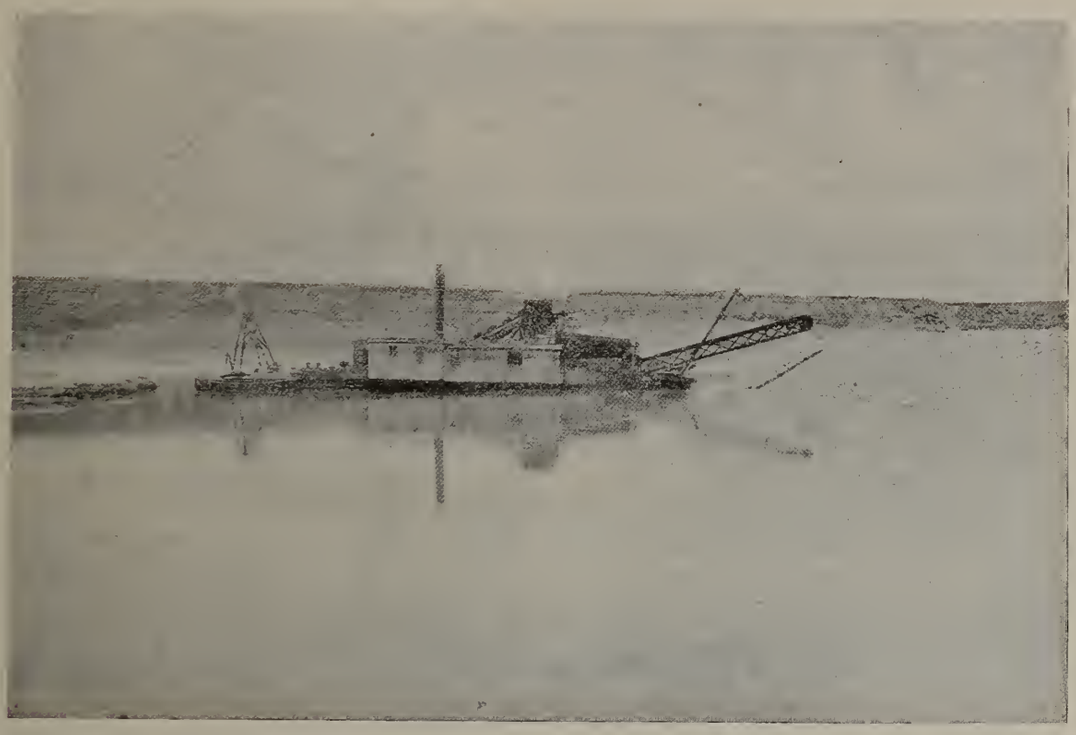


The Molyneux Hydraulic Company's Dredge is probably the largest working machine on the Clutha. The gre. t length of the elevator (60 ft.) enables the tailings to be stacked at any helght not exceeding 35 feet. There are two revolving screens. A nozzle has beeu erected on the bow of the Pontoon, so that when a steep bank is being attacked the ground can be hydrauliced in advance, and the risk of the ladder and buckets being buried beneath heavy falls thereby minimized.



THE MANORBURN DREDGE.

Here a dredge is seen exploiting an auriferous flat away from the river altogether. It is cutting a channel for itself, and stacking it when delivered of its gold behind.



A tailings elevator is here seen at work and the variation between the height of the loosely stacked tailings and the face of the ground being attacked is apparent.

THE EARNSCLEUGH No. I DREDGE.

This dredge is represented leaving the Clutha River and commencing to attack a river flat.

dredges working the Buller River, upon the west coast of New Zealand."

All the rivers of New South Wales which drain auriferous country have now been taken up for dredging purposes. Many dredges are in course of construction, while at least a dozen have already started operations, and the result must cause a considerable increase in the production of gold in the near future. Mr. C. L. Garland's dredge was the first to start, in 1899, on the Macquarie River, near Stuart Town, and the proceeds are understood to be satisfactory. although considerable difficulty was met with owing to the occurrence in the bed of the river of an extremely hard cement, which caused great wear and tear on the buckets and machinery generally, necessitating frequent stoppages for repairs. The experience gained in this instance has been taken advantage of in the construction of later dredges, and the lips of the buckets are now being made much stronger.

The following are the particulars of the pioneer dredge of New South Wales, owned by Mr. C. L. Garland, and working on the Macquarie River: Length of pontoon, 100 ft.; beam, 31 ft.; depth, 6 ft. 6 in.; draught when loaded with 100 tons of machinery, 3 ft. 6 in.; total dead weight of dredge, 200 tons; steam power required, 75 h.p. (actual); capacity of dredge, 12 buckets per minute; capacity of buckets, 4½ cubic feet each.

The dredge is provided with 3 steam engines. The main engine is for actuating the buckets; the second is to work the winch, with 6 drums; the third engine is to work the electric light. The ladder is 68 ft. long, and is fitted with 38 buckets and 2 grab hooks, which will lift boulders up to one ton in weight. The weight of the ladder is 15 tons, and with the buckets attached it weighs 25 tons. When the ladder is inclined at an angle of 45° the machine will dredge to a depth of 40 ft. below the water line. The trommel is 20 ft. long, and has an inside diameter of 5 ft. The dredge is fitted with a 12-in. centrifugal pump, playing water on the gravel in the trommel from a perforated pipe. The capacity of the pump is 2,000 gallons per minute. The elevator will stack the coarse boulders 25 ft. above water level. There are 10 inclined tables, 5 on each side of the trommel, and arranged back to back. The length of the tables is 16 ft., and they are covered with cocoanut matting and expanded metal. The fine tailings escape by launders from the bottoms of the tables, and are conveyed to the stern of the dredge.

Bucket dredges of several other types are now at work in different parts of the colony; thus, in some a pair of revolving screens is used instead of one, while at Araluen 2 dredges are to be seen without either screens or elevators. In the latter case the gravel is discharged direct from the buckets into a sluice box, which delivers the tailings at the rear of the dredge, while the gold is caught in a variety of riffles. Some of these are formed of longitudinal bars, others of angle iron placed transversely, and others again consist of perforated iron plates resting upon coir matting. It is claimed that as much and as good work can be done by a dredge of this construction as by one fitted with a revolving screen, and that the initial cost is appreciably less. On the other hand there is considerable wear and tear of the riffles in the sluice box, owing to the big stones and boulders being carried over them; moreover, it seems probable that the saving of fine gold would be assisted by the action of the revolving screen in separating the large stones and allowing only the finer material to be treated on inclined tables.

However, experience with the different types of dredges will soon determine which are the most suitable for the different conditions met with in various localities. It is obvious that those dredges which have no elevators can only work in deposits of limited depth, since the tailings occupy more space than the original beds of gravel. If, therefore, the deposits be more than 15 or 20 ft. deep, the only way to find room for the tailings is to deposit them in high stacks, and hence the necessity for elevators.

Another method of dealing with auriferous gravels is by means of what are known as pump dredges, which have been introduced into this colony from Victoria. The term pump dredge is somewhat of a misnomer, since the machines do not work by dredging. The process consists of hydraulic sluicing, the necessary pressure being given to the water by means of a powerful centrifugal pump. The water and the gravel which it breaks down gravitate into a suction well or sump in the lowest part of the workings, and from this they are raised by another centrifugal pump and delivered into sluice boxes at a height of about 50 ft. from the floor of the excavation. The bottom of the sluice box is fitted with the usual riffles, which retain the gold, while the water, carrying with it the gravel, flows over the end of the box to the dump. The machinery is all fitted on a pontoon so that it can be floated to a fresh position when desired. When work is about to be commenced on a deposit, and excavation is made of sufficient size to accommodate the pontoon, the water is allowed to accumulate in this and the dredge is launched. The excavation is then drained by means of the centrifugal pump, so that the pontoon can rest on the bottom, and the bank of gravel is worked away by hydraulic sluicing. When the excavation has been so much enlarged that the shifting of the dredge is desirable, this is effected by letting in the water and floating the pontoon to the most convenient position for continuing the work.

The pump dredge has several advantages which make it more efficient than a bucket dredge under certain conditions. Thus, where the bed-rock or "bottom" consists of hard and uneven rock, it would be impossible to obtain the gold lodging in the crevices by means of buckets, whereas no special difficulties would be experienced in such cases with the so-called pump dredge. Again, where a deposit of gravel exceeds, say 50 ft. in depth, it is doubtful whether it would be practicable to work it with buckets, whereas there would be nothing to prevent its being successfully dealt with by the method of hydraulic sluicing and elevating.

When the question of cost, however, is considered, the comparison is all in favour of bucket dredges, which can be worked by two men per shift of eight hours, whereas the pump dredges require eight men per shift. Moreover, as much more powerful engines are necessary for the pump dredges, the consumption of fuel with these is much greater than with the bucket dredges.

Finally, it may be said that in the case of deposits of auriferous river gravels of moderate depth, resting upon fairly soft bed-rock, the bucket dredge is unquestionably the cheapest and most efficient appliance for recovering the gold; but where the deposits are of great depth, or the bed-rock is too hard and uneven to allow of the employment of bucket dredges, the process known as pump-dredging can be successfully employed, provided the gravels be sufficiently rich to cover the extra cost.

The Federal Centrifugal Gold Sluicing Company have recently completed a pump-dredging plant on their mine at Jembaicumbene, near Braidwood. The pontoon is 47 feet long, 39 feet wide and 5 feet deep; it rests on the bottom of the excavation when in operation, but can be floated when it is desired to move it. The engine is a horizontal compound one, of 300 h.p. indicated, with cylinders of 18 and 30 inch diameter, and with a 33 inch stroke. Steam is supplied by three boilers 7 feet 6 inches in diameter by 14 feet long. The flues are 50 feet high by 26 inches diameter. There are two centrifugal pumps of the Kershaw type, each with a 12 inch delivery pipe, the runners and casing being fitted with removable liners. Each pump is driven independently by rope gearing from the crank shaft of the engine. One of the pumps is used for working the hydraulic giant nozzles, while the other elevates the water and gravel to the sluice boxes, which are 45 feet long, and are fixed on a trestle work erected on the pontoon. The engine is sufficiently powerful to drive much larger pumps if desired.

Positive Knowledge.

By ZEKE, in the "Age of Steel."

There is no question but what this is a day of positive knowledge; a time when it is one of the first essentials for a man entering into any business enterprise to know positively what he is doing, and know it beforehand, and young America is to-day being duly impressed with that fact, and receiving all manner of training in keeping with this spirit, but—and this is the point at issue here—how and what is positive knowledge?

We have long since come to understand that there must be some closer relation between theory and practice than was had in days gone by—that the main spring of theory must be wound by the key of practice—and have added manual training to our technical schools, have built various and expensive devices for experimenting and demonstrating theories before offering them to the world in a product. All this, too, is at it should be, and there is no criticism to offer on this point, but it will not hurt us to stop and think a little once in a while in the hope that we may see a way to further extend the closer relationship of theory and practice to get positive knowlege of the kind that is in keeping with the spirit of the day. In other words, experiments and manual training schools, while they do much in their way, do not go to the extent that might be desired in surrounding these tests and experiments with some of the various circumstances that arise in the real industrial work of the day. Every once in a while something turns up which, while it was entirely unlooked for, and can be easily explained after it is over, might have been expected if not prevented. It is not explanations and excuses that we want in this day, though they are pretty good guides for the future and cannot be entirely eliminated, but it is deeds we want, and as near an exact and positive understanding of what is going to happen as possible beforehand.

For example, there was a recent little tilt between a couple of scientific authorities on riveted joints in a steam boiler, as to its efficiency, etc. On the question in controversy here it is not the intention to speak right now, but to point out this something taken from the impressions of an old school engineer on the whole question of stress. He looks at a boiler as he sees it at work in a factory, and when he gets to thinking on the stress problem there is present in his mind the strains on the boiler due to its settings. If it simply has a rest under the front end and another under the back end, as is very common, he sees in his mind a strain on the bottom part of the boiler, the part, too, that is subject to the heat, which, though rather indistinct in his mind if he tries to reduce it to figures, means to him a representation of the weight of the boiler and the water it contains. From this same source of reasoning he figures it out in the same dim way that there is really a tendency toward compression in the top part of his boiler. In such ideas he has some of the richest soil from which positive knowledge grows, and more of this soil is what we need as a fertilizer for scientific propogation of the branch of knowledge that the spirit of the times demands.

A point that must not be overlooked, however, is the fact that we must have this material of practical experience at first hand, or as nearly so as possible, for like some of the stories of old that were handed down from generation to generation, from mouth to ear, the colouring is likely to change so that ridiculous errors will frequently result. An instance in illustration of this point comes to mind at this writing. An English scientific journal of the very highest class, in treating on the subject of corn as fuel following the time when Kansas set the world talking by growing so much corn that it was used in instances as fuel as being cheaper under the circumstances than coal, had an illustrated head piece to the article showing men at work in a field of barley corn. This was nothing serious, of course, but it points us to what may happen in handling information for positive knowledge. The puzzling point in the whole problem is, then, how are we to combine the two essential features for positive knowledge in the mechanics of the day? How are we to get the unadulterated fertilizer of experience, that which is gained by rugged men who have spent years in harness, and have learned, not from schools as we know them now, but from experience unguided except by the brain of the individual, to and mixed with the systematic schooling of young America to-day? We are progressing, of that there is no doubt, and we are getting nearer each year to the point of positive knowledge in mechanical knowledge, but the soil is losing some of its qualities as we go along, and it is in order to look closely after this feature lest a future crop of positive knowledge turns out to be only nubbins at the harvest time.

MINING IN EASTERN ONTARIO.

By C. DE KALB, Inspector of Mines for Ontario.*

The condition of the mining industry in the Eastern District of Ontario is in many respects more satisfactory than ever before. There has been a still more conspicuous reaction from the tendency so common in previous years to organize companies and sell stock based upon undeveloped mines. A perusal of the following report will show that a very large number of promising properties are undergoing extensive development by syndicates or close corporations offering no shares in the public market. By some of these large sums of money have been expended in opening up deposits, in advance of any effort to start production. In nearly every instance the result has been to put in sight important quantities of ore which assays demonstrate can be worked at a profit. This is all in the direction of permanent and successful mining, the good effects of which will be seen later on. There is also a notable increase in the employment of skilled management, many highly trained mining engineers and experienced foremen for mines and works having been brought into the Province within the year, and the local labour is receiving in consequence a better training. A larger number of men than heretofore have adopted mining as a regular vocation, many of whom are improving themselves by taking courses of instruction in correspondence schools. The effect of this is to create a most desirable *esprit de corps*, and at this rate Ontario will soon possess a large body of skilled miners, which will be of incalculable benefit to the mining industry. The absence of any legally enforced qualification for mine foremen is still a drawback, and there seems to be no question that such a requirement would act as an additional stimulant to higher efficiency on the part of the workmen, to their own good and to that of the mine owners.

The copper industry is growing rapidly and promises to assume large proportions. The development of the veins occurring west of the Sudbury district at Massey and in the vicinity of Bruce Mines, is most gratifying. At all of these places the ore in sight has warranted steps for the construction of large mills and reduction works. The future of the Parry Sound copper district is as yet somewhat uncertain, but active development is going forward, and the results are by no means discouraging.

Iron mining is becoming a large factor in the mineral industry of the Province, due chiefly to the extensive operations undertaken by the Lake Superior Power Company at Michipicoton Harbour, but the mines in the extreme eastern portion of the Province are also promising good returns in the near future. Extensive shipments have been made from some of these properties during the year, and in several cases development work has revealed large bodies of high grade ore.

The gold mines in the vicinity of Marmora are on a sound basis,

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and increased plant at these mines, now being installed, will soon lead to a substantial enlargement of the output of bullion. The production of arsenic as a by-product from the gold ores at Deloro has added a new article to the mineral output of Ontario, and the steady manufacture of this material is assured. Only two gold mines of the Eastern district which have figured prominently before the public have closed down, and one of these will be re-opened in 1901 under a new management.

There has been a veritable boom in mica mining in Frontenac and Lanark counties, and a large output has resulted. A careful study of these deposits by the geological corps of the Bureau of Mines might yield information which would prove valuable as an aid in prospecting for this mineral and help to establish the industry on a more permanent basis. The uncertainties attending development work in the mica mines renders the owners averse to continuing exploration where mining temporarily ceases to be profitable. A number of these mines in which work had been discontinued have been reopened with success, but on the other hand many which have produced largely at one time have been abandoned. Reasonably safe criteria upon which to base further development would be a great boon to the industry, and such knowledge can only come by detailed study on the part of trained geologists.

The peat industry is apparently about to become of great importance. The difficulties attending the cheap manufacture of briquettes have been overcome through the courageous and intelligent efforts of the Trent Valley Peat Fuel Company, and it would seem possible to derive a cheap domestic and steam fuel from the numerous peat bogs in the Province. The Peat Fuel Syndicate of Toronto has also been investigating the preparation and uses of peat in foreign countries, and has been conducting experiments which will tend to develop fully the commercial possibilities of the industry. The utilization of peat as a source of fuel and illuminating gas is being tested, and bids fair to prove successful. A special investigation is being made by the Bureau of Mines into the value of peat for fuel and gas, which will shed much light on this question.

Gold Mines.

The working gold mines of the Eastern District are are at the present time confined to the vicinity of Madoc and Marmora. The work here has passed the experimental stage and gives every indication of permanent operations. Development has been carried on systematically, putting large ore reserves in sight; and the problem of extraction has been thoroughly solved in each case.

THE BELMONT MINE.

This property has been operated under option granted to the Cordova Exploration Company, Limited, of Newcastle-upon-Tyne, from Mr. A. W. Carscallen, of Marmora, for several years. During this period development work has been actively in progress under the skillful superintendence of Mr. D. G. Kerr. At the same time a 10-stamp mill has been working upon ores taken from various mines on the property, the object being chiefly to test the value of the ore by mill-runs. The stoping consequently has not been extensive in any one part of the deposit. In September, 1899, the property was purchased from Mr. Carscallen, and production upon a larger scale will soon commence. All the improvements now in progress are of a permanent character, but extensive development of the deposit is still being prosecuted, which may lead to a further enlargement of the milling plant in the near future. The property acquired consists of 300 acres owned in fee simple in Belmont township, Peterborough county; mineral rights in 125 acres in Marmora township, Hastings county; mineral rights under the county roads, acquired from the township councils; and 160 acres of land including a water power on Deer river, at the outlet of Deer lake, 2 miles west of the mine.

Development work has been carried on in ten shafts, of which Nos. 1, 2, 3, 6, 7 and 10 are in actual operation. Shaft No. 1 has attained a depth of 310 feet, being an increase within the year of 175 feet. Hoisting is done by a skip, using telescope rails at the lower end of the skipway to admit of hoisting rock from the bottom while sinking is in progress. Shaft No. 2 is 165 feet deep, being an increase of 130 feet. This shaft is connected by levels with No. 3, which is the main shaft for this mine, No. 2 being practically an air shaft, although ore and rock are at times hoisted through it. Shaft No. 3 had reached a depth of 185 feet when sinking was discontinued. A new pump is now being installed to permit of going to deeper levels. Shaft No. 6 has been sunk since the inspections of 1899, and is located 750 feet northeast from shaft No. 1. It has been carried to a depth of 85 feet, with a cross section of 12 by 8 feet, inclining 75 degrees towards the southwest. It is divided into two compartments for a hoist-way and manway. The hoisting works consists of a head frame 12 by 14 feet at the base, and 20 feet high to the centre of the sheave. Shaft No. 7 is also new. This is located 425 feet north of shaft No. 1. It is vertical, with a depth of 80 feet, and a cross-section of 16 by 9 feet. The hoisting works are 17 by 35 feet at the base, and 35 feet high, and are equipped with a 30-h. p. double drum hoist actuated by compressed air taken from the central air compressor plant. Shaft No. 10 is likewise part of the recent development of the property. It is 560 feet east of shaft No. 5, the latter being 1500 feet southeast of shaft No. 1. The shaft inclines 75 degrees to the south, and has been sunk to a depth of 35 feet, maintaining a cross-section of 14 feet by 10 feet. No permanent hoisting works have yet been erected over these shafts.

In shaft No. 1 there has been no change in the 75-foot and 120-foot levels. A new level has been driven at a depth of 200 feet from the surface, extending 50 feet east and 50 feet west from the shaft. A level has also been driven at 300 feet distance from the top, 50 feet east and 30 feet west. A sump has been excavated near the shaft on both these levels, and on the 200-foot level a Northey pump having a capacity of 250 gallons per minute has been installed, while a new pump of 150 gallons capacity is being set up on the 300-foot level. The motive power for these pumps is compressed air at 85 lbs. pressure.

In shaft No. 2 a level has been run at 50 feet from the surface, 260 feet northwest and 110 feet southeast to shaft No. 3; and at a depth of 90 feet is a level extending 350 feet northwest and 110 feet southeast to shaft No. 3. In the east drift is a new stope, 100 feet long, 10 feet high and 6 feet wide.

In shaft No. 3, at a depth of 25 feet is an incline connecting with the 50-foot drift southeast from shaft No. 2. At a depth of 95 feet in this shaft is the connection with the 90-foot drift southeast from No. 2 shaft, and at 185 feet is a drift northwest 250 feet in which a raise has been started to connect with the bottom of shaft No. 2.

A level has also been started in shaft No. 7, extending 20 feet northwest and 65 feet southeast.

As the levels from these several shafts are extended they will connect with each other, linking the shafts into one connected mine. A trestle for a 24-inch gauge tramway track is being continued from shaft No. 1, which will extend to shafts Nos. 7,6,2,3,5 and 10, in the order named, thus making a large arc.

A new shaft-house has been erected over No. 3 shaft, with a head frame 18 by 35 feet at the base, and 30 feet high to the sheaves block. The skip in this hoist is operated by a 30-h.p. compressed air hoist.

The stamp mill is being quite thoroughly overhauled, and 10 additional stamps are being installed, as well as a cyanide plant for concentrates.

The requirements made for additional safety are being suitably attended to. The official signal code is being used at all shafts. It was advised that the powder man be required, among his other duties,

to include that of preparing all primers in and about the mines. The company has been peculiarly unfortunate in loosing four men by dymamite explosions during the year, two of these being the result of negligence on the part of the miners, and two the result of a premature discharge of explosive while loading a hole, the cause of the explosion being undetermined.

THE DELORO MINE.

The extensive development work carried on upon the property of the Canadian Goldfields, Limited, during the year 1899 has apparently assured permanent work at Deloro, and in consequence important additions to the plant and equipment are being made. The stamp mill is being enlarged to double its former capacity and Mr. P. Kirkegaard, the manager, has developed an improvement in his method of treatment which will enable him to mill upwards of 100 tons of ore per diem. The plant when complete will comprise rock breakers, jigs, 20 stamps of 850 lbs. each, Wilfley tables, Bartlett concentrators, and Frue vanners. The cyanide plant is also being enlarged by the addition of an extra vat. The mill is a model of scientific arrangement, and includes some new features of great merit, permitting of the elimination of barren gangue early in the process, by which means large capacity is secured at very low cost. The arsenic works constitute a prominent part of the plant, and are turning out a purer grade of white arsenic than any of the foreign competitors, with the result that the product is in large demand at the highest market prices. The arsenic is sold chiefly in New York, though a portion of the output is taken in Canada. At the present time the arsenic plant is undergoing complete reconstruction, for the purpose of securing a larger yield at reduced cost per ton. The difficulties formerly experienced at Deloro from the loss of arsenic, and the consequent imperilling of live stock in the vicinity, have been entirely overcome by modifications in the construction of the condensing chambers, coupled with the introduction of mechanical draft. No cases of arsenic poisoning have occurred, great care being observed to preclude accidents of this sort. Separate rooms are provided for the clean clothing and the working clothes of the employees, and ample facilities for bathing are connected with the dressing rooms. The men are required to bathe at the end of each shift, no deviation from this rule being permitted. Antidotes are freshly prepared at frequent intervals, and are kept accessible in two places in the works, and certain men in each shift are instructed in their proper use.

The company is also making provision for the entertainment of the men, and for the education of their children. To this end a lecture hall and library, and a school are in process of erection near the general office building. Books and periodicals will be provided free of cost for the use of employees of the mine.

The surface plant is being further increased by the installation of a new air compressor to provide air for a Harris air lift which is to raise all the water from that portion of the property reached by the Gatling and Tuttle shafts An electric lighting plant is also being provided, the engine and dynamo being placed in the present engine house near the stamp mill

In place of the old stone dynamite magazine, which was too close to the mines and works, a new one constructed entirely of wood, well ventilated, and with sand filling in the hollow wall spaces, has been provided, standing detached 600 feet from the arsenic works, and 1,000 feet south of the mill. A new dwelling has also been erected for the mine foreman.

The progress in underground work during the year is as follows: Gatling level No. 3 south, increased 169 feet 3 inches to a total of 426 feet 3 inches; Gatling level No. 4, increased 360 feet to a total of 393 feet 6 inches; Tuttle crosscut level, south, increased 41 feet to 135 feet; Gatling crosscut level, south, increased 8 feet to 120 feet 6 inches; 3rd level stope beginning 200 feet south from Gatling shaft, working underhand, the full height of the block between the second and third levels; a raise is also being driven up from the fourth level, 250 feet south of Gatling shaft, which at the time of last inspection was 23 feet high. The tuttle shaft has been connected down to the fourth level. Work is also in progress in the Red shaft, stoping south on the 40 foot level, in oxidized ore.

All recommendations for safety have been carefully attended to, chief among which was the construction of a new magazine in a place of greater security. The official signal code is not in use, but its adoption was requested in conformity with the resolutions.

THE ATLAS ARSENIC COMPANY.

The mines and works of this company, as previously stated, are situated upon a tract known as the Gatling Five Acres, entirely surrounded by the property of the Canadian Goldfields Limited. The ores are identical in character with those encountered in the Deloro mine The shaft has attained a depth of 100 feet, being an increase of 15 feet. Level No. 1 northeast, has been lengthened 65 feet to a total of 185 feet. The southwest drift remains unaltered. Overhand stoping has been carried on in level No. 1, northeast, a slice 45 feet high and 125 feet long have been removed. A raise through this stope-block has also broken through into the old surface workings, 20 feet southeast of the new mine. A power house has been erected 60 feet west of the shaft, having foundations 50 by 30 feet. This contains two rooms, one for the 80-h.p. boiler and a small duplex hoist, and one for a 9-drill duplex Rand air compressor. The old boiler-house adjacent has been converted into a blacksmith shop. A new dynamite magazine has been erected in accordance with the regulations in the Mines Act, 400 feet west of the power house, having a hill between it and the works. The stamp mill is temporarily idle, but will soon be in operation again. Instructions were given to put up a gate at the mouth of the old workings leading from the surface into the first level stope.

THE SOPHIA MINE.

The Sophia mine is the same as that referred to in previous reports under the name of the Diamond mine. Through the efforts of Mr. D. E. K. Stewart of Madoc this property has been placed upon a substantial footing, and is now owned by Messrs. Peter McLaren, Leopold Meyer, and Charles Meyer. It is being operated under the management of Mr. Leopold Meyer of Madoc. Its situation is seven miles east northeast from Madoc, and about one mile from Queensboro. The holdings of the syndicate consist of the west half of the east half of lot 14 in the tenth concession of Madoc, the west half and the west 20 acres of the east half of lot 15 in the same concession. There are two veins on the property, viz., the "mispickel vein," with a course due north and south, and the "free milling vein," running northwest and south east. The workings consist of the following: On the mispickel vein, No. 1 shaft, with a cross-section of 9 by 18 feet, and a depth of 60 feet. Drifting has just commenced at that depth. Hoisting is still done by hand windlass, operating a bucket on a skidway. On the free milling vein is the principal working shaft, known as No. 2. This has a cross-section of 9 by 18 feet, and a depth of 105 feet. There are two levels, the 60-foot and the 100-foot. On the 60-foot level there is a northwest drift 20 feet long, and a southeast drift 10 feet long. At the 100-foot level the northwest drift has been run 58 feet, and the southeast drift 10 feet. A skipway was being installed, and an inclined trestle carried the track to the upper part of the mill, where was located the hoisting engine. The skip will thus be drawn directly from the mine into the mill and then dumped. No. 3 shaft is also on the free milling vein. This is 60 feet deep, with the same cross-section as the other shafts. At the time of my visit this working was closed and full of water. It was kept securely fenced. Water was lifted by buckets from No. 1 shaft, but No. 2 was kept unwatered by a duplex steam pump. The ladder-way was being put into suitable condition, with a partition between it and the hoisting compartment.

The reduction works consist of a 10-stamp mill erected by the William Hamilton Manufacturing Company of Peterborough. The equipment comprises a 7 by 10-inch Blake crusher, 10 stamps of 900 lbs. each, a Wilfley concentrator, a 70-h.p. return flue boiler, and a 50-h.p. Corliss engine. There is also a blacksmith shop 100 feet south of shaft No. 2, and an assay office 150 feet south of this shaft. Dynamite was temporarily stored in a dug-out 300 feet southeast of shaft No. 2. Instructions were given to promptly provide a suitable magazine at a distance of not less than 400 feet from any workings or structures.

HELENA MINES.

The Helena mines are situated 18 miles northeast from Kaladar in Barrie township, Frontenac county, embracing lots 19 and 20 in the sixth concession, and lot 20 in the seventh. The owners are Mr. Michael Seitz of Brooklyn, New York, and Mr A. M. Chisholm, whose address is Cloyne P. O., Ont. The ores consist of copper and gold, in a quartz vein through crystalline limestone. The workings consist of three shafts. The "Hill shaft" is on lot 20 in the sixth concession. It is a two compartment inclined shaft, 16 by 12 feet in cross-section, and 125 feet deep. The angle of inclination is 45 degrees. The "Valley shaft" is 600 feet northeast from the Hill shaft, having the same cross-section and inclination, and has also reached the same depth. A drift has been run from the bottom of this slope, 25 feet east. The "Bill shaft" lies 300 feet north northeast from the latter working, and has attained a depth of 185 feet with a cross-section of 10 by 12 feet. This is a one-compartment shaft, with a ladder-way not yet boarded off. Hoisting is done with steam hoisting engines at each shaft, and a 20-drill Rand air compressor is being installed at the Bill shaft. The power for this compressor is taken from a 16-foot waterfall on the Mississippi river. Extensive development of these mines is contemplated for the year 1901.

COPPER MINES.

The continued high price of copper has led to active development of veins in several localities, and the present indications are that considerable quantities of copper will be produced from Ontario mines in the near future, independently of that obtained in connection with nickel in the Sudbury district. Outside of the aforesaid district copper veins of more or less promise occur in four fairly well defined zones in eastern Ontario.

In the eastern part of the Province copper is found at many points in Frontenac and Hastings counties. The Helena mines are the only ones in which important development has so far been made. The veins are usually well defined, containing chalcopyrite in quartz, with occasionally some bornite, and at a few places a little chalcocite and tetrahedrite has been reported. This district is one which apparently might justly deserve more attention than has hitherto been given to it. Gold occurs throughout it, and is generally associated with the copper.

The next belt towards the west is in the Parry Sound district. The veins occupy the lines of shear faults, and have produced considerable quantities of bornite near the surface. Development work has not yet been sufficiently extensive to demonstrate the value of the deposits, but the region is a promising one, and work is being prosecuted at a number of points which will soon show the character of the veins.

To the westward of the Sudbury copper-nickel group of mines there succeeds another group of veins carrying copper, with small quantities of gold in some cases. These are all highly silicious ores, averaging about 4 per cent. of copper, and at one locality high-grade shipping ore was produced down to a depth of about 100 feet. The most easterly of these veins so far discovered is in the vicinity of Massey, and the most westerly at Bruce Mines.

The fourth group embraces those on Michipicoton Island, with which the writer is not familiar.

BRUCE MINES.

This old, well-known group of mines has been acquired by the Bruce Copper Mines, Limited, of 31 Palmerston Building, Old Broad St., London, E.C. The area controlled consists of 5,000 acres held in fee simple, and mineral rights in 12,800 acres additional lying in the township of Plummer and Plummer Additional. The resident manager is Mr. William Braden, formerly of Helena, Montana.

The shafts have been renamed as follows:—No. 1, the old shaft northwest of the old Copper Bay or Bray shaft; No. 2, formerly called the Bray shaft; No. 3, formerly the Mitchell shaft; and No. 4, formerly the Scott shaft. The work so far done under the new management is the following: No. 2 shaft deepened from 420 to 435 feet, and at the 420-foot level a crosscut driven southwest 18 feet. In the same shaft, fifth level, the southeast drift has been prolonged 19 feet, and the northwest drift at the old caved ground is being straightened. In No. 4 shaft the old timbers, and the old Cornish pump rods and column pipe have been drawn, and temporary cribbing has been carried down 40 feet to facilitate cleaning out preparatory to equipping this for the main shaft to serve future mining operations on the property.

Work was only beginning, at the time of my visit, upon the surface plant, which is to be one of the most extensive in Ontario. Large hoisting works will be erected over No. 4 shaft, in which will also be located the rock breaker. From this point the broken ore will be conveyed about a half mile to the new mill which will be erected near the site of the original concentrating works operated in the early days of mining at Bruce Mines. This mill will be equipped with the latest improved concentrating machinery, and will have a daily capacity of 400 tons. Close by the concentrator will be erected a smelting plant, consisting of ordinary blast furnaces and a refinery.

Dynamite was stored in the old stone magazine erected many years ago about one mile east of the mine. This contained a quantity of old black powder and other materials which had been left there for a long period. Instructions were given to clean this out, and destroy all old stock. It was also advised to provide a separate structure near the mine for a small supply of explosives for immediate use. Some minor recommendations were made concerning timbering in the mine, and attention was called again to the necessity of fencing off the old workings east of the Wellington vein.

ROCK LAKE MINE.

Important work has been done upon this property in the development of the ore bodies, and in the erection of surface plant, within the past year. The main shaft has been deepened to 420 feet, being an increase of 252 feet, the cross-section of 9 by 16 feet being maintained to the bottom. It is divided into three compartments—a manway and two hoisting compartments; one hoisting compartment being fitted with guides for a kibble cross-head, and one fitted up for a cage. The shaft is well trimmed up and securely timbered. The 100-foot level has been extended north-west 65 feet, giving it a length of 114 feet, while the south-east drift has been lengthened from 45 to 127 feet. The 200-foot level, started since my last inspection, has been driven 93 feet north-west and 76 feet south-east. The 300-foot level has been driven 26 feet north-west from the cross-cut into the ore body, and cross-cuts have been run from the 400-foot depth in the shaft, preparatory to drifting. A cross-cut 27 feet southwest has been run on the first level, starting 110 feet from the shaft in the south-east drift, and another starting 113 feet from the shaft in the north-west drift extends 38 feet south-west. In the second level a cross-cut 27 feet long extends south-west from the south-east drift, commencing at a point 74 feet distant from the shaft; and another, starting 90 feet from the shaft in the north west drift, extends 27½

feet south-west. In the third level the cross-cuts start from the shaft and extend respectively 37 feet north-east, and 38 feet south-west. The 20-foot extension of the shaft below the fourth level is used as a sump. In addition 27 open cuts have been made on the vein at intervals through a distance of two miles from the shaft to Rock Lake, in a north-westerly direction.

A railroad has been graded from the mine down the gorge, following the general direction of the vein, and terminating at a mill site on the shore of Rock lake. A locomotive and other rolling-stock had arrived at Bruce Mines station on the C.P.R., 12 miles distant, and was soon to be transported to Rock Lake for the equipment of this line. (The rolling-stock has since arrived on the ground.) The mill, or concentrating works, were in process of erection.

The mill will contain a 250-h.p Corliss compound condensing engine, with three horizontal tubular boilers, and crushers, jigs, Wilfley tables, and accessory appliances. The capacity of the plant will be 200 tons of ore per diem. Accessory plant consists of a brickyard equpped with a pug mill and an improved Martin brick machine, having a capacity of 10,000 bricks a day. This is located one mile west of the shaft. A saw-mill is also erected adjacent to the brickyard.

In order to ship the concentrates from the mine to navigable water on Lake Huron, the company has organized the Bruce Mines and Algoma Railway Company, Limited, and hopes to construct the line as far as Bruce Mines within the near future. This is a necessity for the economic operation of the property.

MASSEY COPPER MINE.

This is the most recently developed copper mine promising permanent operation in the Province. The lode was uncovered in the south-west quarter of section 14 of Salter township, Algoma, and extends both eastwardly and westwardly for some distance in the same township. The entire property comprises 800 acres, and is owned by Mr. R. M. Thompson, of New York, and Major Robert G. Leckie, of Sudbury. The same parties also own options on two waterfalls on the Sable river, 2½ miles from the mine, and on two falls near Massey, aggregating 2,000 h.p. The purpose of the owners is to operate air compressors on the Sable river, and transmit this power for use at the mines. The main shaft is on the south-west quarter of section 14, and is about three miles north-west from Massey. It has reached a depth of 80 feet, with a cross-section of 7 by 14 feet, being divided into a hoisting compartment and manway. Hoisting is done with a horse whim, operating a bucket on a skidway. A temporary whim shed and blacksmith shop have been erected at the shaft mouth.

The vein has been opened for a distance of one mile by test pits, revealing a continuous ore body in what is apparently a shear zone in the green schists, following the direction of fissility of the enclosing rocks. The lode is brecciated at places, the fracture planes having been healed with deposited quartz. The chalcopyrite, however, seems to bear no direct relation to these accidental quartz veins, being the result of misplacement in the schist itself, unassociated, so far as exposed, with any other gangue than the residual decomposed country rock. The lode is approximately parallel with the contact between the schists and the granite, lying from a few hundred feet to a quarter of a mile south of the contact between these formations. The ore is said to vary from 3½ to 6 per cent. copper, with small amounts of gold.

The proposed treatment is to sort out the higher grade ore, shipping this to the New Orford smelter at Copper Cliff, where the silicious ore from Massey will be desirable in order to produce clean, relatively acid slags. The lower grade ore will be transported by an aerial tramway down grade to the Sable river, where it will be treated in concentrating works.

PARRY SOUND COPPER MINING COMPANY, LIMITED.

This company, controlling what are popularly known as the McGown mine and the Wilcox mine, has done some further development within the year, and latterly has revealed extensions of the ore body in the McGown property which give promise of permanence, although the mine is still in an experimental stage. The incline shaft, after attaining a depth of 160 feet, was abandoned, and a new incline about 100 feet north-east of the former shaft was started towards the south, on an angle of 45 degrees. The main shaft, which is vertical, has reached a depth of 238 feet. At a depth of 160 feet is a level, driven 25 feet north-north-east, and 30 feet south-south-west. This is still in process of sinking. Hoisting is still done with a kibble, which is also used for lowering the men, the ladders being carried only to a depth of 85 feet. Five days were given as a limit within which a ladderway to the bottom must be provided, after which hoisting and lowering men in the bucket was to be prohibited. The hoisting engine was located in the same building which enclosed the gallows-frame. The official signal code was in use Another test pit had been sunk 33 ft., with a cross-section 10 by 8 feet, on the shore of McGown Lake, 200 feet southeast of the main shaft. The old Discovery pit is also being deepened by an incline on an angle of 10 degrees toward the south-west, having reached a depth of 30 feet below the surface, the lower end being under the lake. Hoisting here is done with a derrick and horse whim, provided with a band-friction brake. Cribbing at the mouth of this pit was recommended to insure safety. Further ventilation was also advised for the dynamite magazine, which is located 500 feet south of the main shaft. The mill has been operated for a short period, but is now idle.

Dawson & Selwyn Memorial Portraits.

In recognition of the invaluable services rendered towards the development of the mineral wealth of Canada by the late Dr. George M. Dawson and his predecessor, Dr. A. R. C. Selwyn, late Directors of the Geological and Natural History Survey of Canada, the Canadian Mining Institute invites subscriptions from the Canadian mining public towards its fund for the purpose of presenting suitable portrait paintings of the late Directors to the Museum of the Survey with which their life work has been so prominently identified. Remittances marked "Dawson and Selwyn Memorial Portraits" should be sent to the Treasurer of the Canadian Mining Institute, Mr. J. Stevenson Brown, Temple Building, Montreal, or to the undersigned. All subscriptions will be acknowledged in these columns. The following amounts have been subscribed to date:—

B. T. A. BELL,
Secretary.

Lord Strathcona	$150.00
Canadian Mining Institute	100.00
Officers of the Geological Survey	54.00
Hon. Sydney Fisher, M.P., Ottawa	25.00
London & B. C. Gold Fields, Ltd , Nelson, B.C.	25.00
Canadian Mining Review, Ottawa	25.00
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R. D. Featherstonehaugh, Atlin, B.C.	5.00
W. A. Preston, Mine Centre, Ont.	5.00
W. F. Ferrier	5.00
G. J. Ross, Nelson	3.00

MINING IN NOVA SCOTIA.

The Guffey Jennings Mining Company have sold their property in Caribon, Halifax County, to the Baltimore and Nova Scotia Mining Company. The figure we understand is in the neighbourhood of $300,000. Mr. W. Prisk, who has developed this property so successfully for the late Guffey Jennings Company, will be retained as manager by the new company and Mr. L. W. Getchell, who is a large stock holder in the new company, will ast as superintendent.

The Guffey Jennings Company, who purchased the property from W. H. Sanders some three or four years ago, have thoroughly developed the property and to-day there are over 250,000 tons of ore of known value in sight. The new company have given instructions to sink the shaft, which is now at a depth of 600 feet, to 1,000 feet, and open up levels every 100 feet. They will also erect a new modern mill, capable of dealing with the large body of ore they have in sight. It appears likely that within the next twelve months this mine will be one of the principal producers in the province.

The Richardson Mining Company started a vertical shaft at the east end of their property with the view of cutting the eastern extension of the Richardson vein on the turn of the anticlinal, at a depth of 430 feet; the shaft is now down rather more than 200 feet, and in that depth three new veins have been cut, giving a combined width of over 60 feet of quartz in the shaft. Prior to the starting of this shaft these veins were not known to exist. All the new veins show gold more freely than the old Richardson vein. The company have erected a wharf at Isaac's Harbour and are putting in a line of railway from the wharf to the mine. All these expenses are coming out of the profits of the Richardson vein and no call has been been made upon the shareholders for them. Truly 3 pennyweight ore is a paying proposition in Nova Scotia.

The Great Belt Mining Co., who have purchased the old Cunningham and Curran property at Mount Uniache, are in the field with a glowing prospectus, including a report by one Malt Alderson by name. We scanned the report roughly, which reads like a dream and is really quite poetical in places, but our feeble imagination cannot realize billions of dollars in gold to be obtained by merely scratching the surface—it is beyond us. But why did that report ever see the light of day with such excellent names as appear on the directorate? We have seen the hole upon the edge of which Malt probably sat when he had his day dream, and a more dangerous or uglier looking place to work in it would be difficult to imagine; but at the same time we can well imagine that if the property is mined in a workmanlike fashion good profits may accrue from it. The property is situated on the south dip near the anticlinal axis and there are a large number of small veins, many quite close together, and three or four could be conveniently worked at a time in safe underground workings, but if the present system of open cut working is followed there will most certainly be death in the pot before very long.

Mr. W. R. Askwith (who for the last two years has been in private practice with Mr. F. H. Mason at Halifax as consulting Mining and Metallurgical Engineers) has taken a position with the Clergue Syndicate at Sault Ste. Marie.

Mr. F. W. Edleston has several mining properties under examination.

Mr. Link is making an examination of the Cow Bay mines with view to purchase.

The National Mining Co. are developing the Prince of Wales and Queen veins at Mount Uniache. Mr. F. H. Mason, of Halifax, is acting as their consulting engineer.

BRITISH COLUMBIA NOTES.

The Lade Group, Lardeau, has been bonded by W. B. Pool for $100,000.

The output of concentrates from the St. Eugene Mine, Moyie, East Kootenay, for the month of June was 2,200 tons.

Mr. E. Bigelow, represensing the International Gold Mining and Development Co., has taken up the bond on the Mastodon Group on Salmon River.

The Silver King Mine, Nelson, has resumed shipments to the company's smelter, which had been running on custom ore for some time. 130 men are employed at the mine.

A recent strike of six inches of dry ore, running 7,860 ounces silver to the ton, has been made on the Silver Glace, Slocan Division. The property is owned in Kaslo.

The mines at Sandon, Slocan Division, are all working a more or less limited number of men. The Slocan Star employs 125; the American Boy 35; the Payne and Last Chance 30 each.

The free milling gold belt, in the Lardeau District, continues to attract considerable attention. The properties now being worked are developing nicely, among the most promising of which is the Oyster Group. The area of free gold ledges is found to be more extensive than at first supposed.

The total output of coal from the Fernie Fields for 1900 was 206,803 long tons. The total coke production was 65,915 tons. Total amount of coal used in making coke, 103,031 tons. Of the coal production 89,841 tons were consumed in Canada and 7,968 tons exported to the United States. Of the coke production 27,065 tons were sold in Canada and 38,958 tons were exported to the United States.—Report of the Minister of Mines.

The Mine Owners' Association is in session at Nelson this week. The labour situation and the lead market are the chief subjects of discussion.

Owing to the low price of lead and the excessive charges for smelting and transportation, the North Star Mine will reduce its output from 2,000 tons to 1,000 tons per month.

The Eva Mine on Fish River, Lardeau District, has been sold by the Imperial Development Syndicate, Limited, A. H. Gracey, Manager, to the London and B. C. Gold Fields for $250,000. There are a number of free milling gold ledges on this property. The development work, consisting of numerous open cuts, tunnels and winzes, shows that the ledges maintain their size and ore values with depth.

A. F. Rosenberger, of Nelson, has bonded the "Oyster" group on Lexington Mountain, adjoining the Eva Mine. Development work will be started at once. Mr. Rosenberger has also bonded the "Sir Wilfrid" group, the "Noble Four" group and the "Excelsior" claim on Pool Creek, for the purpose of developing which he has organized a local syndicate.

Shipments from the mines of the Slocan Division for this year, to date, are:

Arlington	1,845	tons.
Enterprise	240	"
Two Friends	40	"
Black Prince	100	"
Bondholder	23	"
Chapleau	15	"
Speculator	10	"
Phœnix	23	"
V. & M.	20	"
Total	2,316	tons.

New discoveries of free milling gold ledges are reported from Lexington Mountain and Camp Creek, Lardeau District.

About 1,000 tons of ore from the Payne Mine are being treated at the Noble Five mill at Cody.

At the Last Chance Mine, in the Slocan Mining Division, a cross-cut tunnel is now in 1,400 feet. The results so far have been very promising. This property is not shipping at present, work being confined to drifting and cross-cutting, on which 16 men are employed.

At the Silver Hill Mine, in the Ainsworth Mining District, development work will soon start on a large scale. The management will build a tramway from the mine to the wagon road, which will effect a very considerable saving in the cost of handling the ore. The success of the Silver Hill Co. in developing its property has greatly stimulated prospecting in this vicinity.

The last payment on the bond of the Iron Horse, Ten Mile, Slocan City Mining Division, has been deposited in the bank. The original amount of the bond was $19,500, held by Spokane capitalists. The property is being steadily developed; machinery will be installed, and work will now be carried on on a large scale.

Last year's exports from the Slocan Division amounted to 2,847 tons, made up from 10 properties. Shipments for this year, to date, are as follows:

LAKE OF THE WOODS.

Sultana.—Diamond drill exploration is still being pursued at this mine. It is announced that a few days ago the drill penetrated six feet of valuable ore to the east of the workings. It is expected that this ore body is the continuation of the main Sultana ore body which was lost near the bottom of the main shaft.

Black Eagle.—A large force of men are employed in excavating the foundation for the new mill of thirty stamps which is being constructed by the Jenckes Machine Co. A double shift of miners are engaged in straightening the main shaft, which will be equipped with a first-class modern hoist.

Mikado—Manager McMillan reports striking ore of phenomenal richness below the 8th level in the inclined shaft, which is now close to 1100 feet deep. The mill is kept going part of the time on ore from development. The Company have placed $75,000 more working capital in the hands of the management to be used for development only and have given instructions that the product of the mill is to be used for this purpose for 12 months.

Golden Horn.—Fine specimens are being shown from the new shaft, which is down nearly 50 feet.

Olympia.—A deal is now assured on this property, near the Mikado, by which a large amount of capital will be provided for development.

Esclimider.—A force of men under Mr. Hunter, of Milwaukee, are exploring this group of properties on Hilly Lake, 6 miles east of Rat Portage.

Scramble.—It is rumoured that this famous property will be placed at once under development.

Nish-shish-in.—This property has been shut down pending negotiations for an extension of the option under which the work is being done.

Boulder.—Sinking and cross-cutting are being carried on at this mine.

Gordon.—James Gordon is sinking a shaft 100 feet on this property, lying east of the Champion.

Homestake.—The new hoist is working satisfactorily, and Mr. Breidenlach has a new sampling and testing outfit at work to find the most economical method of treating the somewhat complex ores produced by this mine.

Sakoose.—Shipments continue steadily to the mill at Keewatin.

Larson Reef.—This property, situated south of Dryden, has recently been equipped with hoist and compressor.

Big Master.—Sinking on the main shaft and drifting on No. 1, or "Little Vein," are proceeding at a rapid rate.

Reliance Co.—The ten stamp mill is to be erected at once and a new hoist and compressor installed at the Independence.

Golden Eagle.—A recent mill run of 19 tons was made at the El Dorado mill on Eagle Lake and returned $8.53 per ton on the plates. A small force of men are drifting to the south pending the installation of a hoist, when sinking will be resumed.

Grace.—Charles Brent, M.E., last week reported on this mine in the interest of Buffalo capitalists.

EAST KOOTENAY.

The Windermere Mining District of North-East Kootenay is attracting a fair share of attention this season. At the present time there are two government wagon roads in course of construction. One road leads from the Town of Peterboro up Toby Creek, some fifteen miles, to North Fork Creek, and will afford an outlet for the ore from the Paradise and Delphine mines, owned by Messrs. Hommunel & Bruer. There are other properties in course of development which will be benefitted from the ease and economy of getting in supplies. The Richmond Mining Company, of New York, are developing the Monarch Group, and a force of men are driving a tunnel to the ledge on the Mineral King. On this property a good ledge of concentrating galena has been encountered. The owners of the Elora claim are preparing to prosecute work on their copper property, which has a foot ledge of chalcopyrite carrying 32 per cent. copper and 30 ozs. silver. The pay dirt begins at the grass roots.

The other wagon road was begun last week (about July 2nd), and will lead from Peterboro to the Macdonald Mine, some thirty miles from town, and will afford an outlet for the properties on Horse Thief Creek and its tributaries, which are Boulder, Law and Macdonald Creeks. The Macdonald Mine was a year ago known as the Red Line. It was purchased early in 1901 for $50,000, and development work is being pushed with the view of having it on the list of shippers when the snow comes. In the absence of railway transportation from the mine ore can be hauled to the Peterboro steamboat landing in winter at a minimum cost. The Macdonald Mine is blocking out a large body of ore, and promises to be a heavy shipper.

The Tecumseh and Silver Thread and Paying Teller are on Law Creek, in the same locality, and will be developed this season. They have large ore bodies exposed on the surface and only need development work to place them on the shipping list.

Boulder Creek has the Delos, a copper property which is crown granted. There is a good body of ore, but, on account of the cost of transportation, has been idle for two seasons. It is understood that the construction of the wagon road will result in this property being worked. The Sitting Bull group of claims is on this creek, also the Alps group and the White Cat. The Sitting Bull consists of three claims, crown granted, and with pay ore in all the workings. The White Cat has over three feet of high grade galena exposed for a considerable distance. The owners are content to let it lie until better times, with only work enough to hold the property. From surface indications it is one of the best properties in this district.

These few mentioned have most work done, but there are other properties that have surface showings from nine inches to two feet in width. The bulk of claims are in the hands of original owners, who are looking for the advent of the capitalist. There is probably no better field for the conservative inventor than the Windermere District.

NEW COMPANIES.

BRITISH COLUMBIA.

Consolidated White Bear Mining Company, Limited.—Incorporated 24th June, 1901. Authorized capital, $300,000, in shares of 10 cents. Formed to acquire and work the "White Bear Mine," situate at Rossland, B.C.

Gopher Mines, Limited.—Incorporated 29th June, 1901. Authorized capital, $100,000, in shares of 10 cents each.

Lardeau Valley Mines, Limited.—Incorporated 22nd June, 1901. Authorized capital, $150,000, in shares of 10 cents each.

Snowshoe Gold and Copper Mines, Limited.—Incorporated under the Companies Acts, 1862 to 1900 Authorized capital, £250,000, in shares of £1 each. Formed to acquire the Snowshoe Mine and certain adjoining properties, situate in the Boundary District, near Phœnix, B.C. Head office: T. J. Morris, Secretary, 7 Poultry, London, England.

ONTARIO.

H. H. Vivian Company, Limited.—Licensed under the Laws of Ontario, 6th May, 1901. Authorized capital, $15,000. Formed to acquire and develop certain nickel mineral lands in the District of Nipissing, Ont. Head office: A. H. F. Lefroy, Barrister, Toronto, Ont.

Ontario Portland Cement Company, Limited.—Incorporated 11th July, 1901. Authorized capital, $450,000, in shares of $100 each. Head office: Brantford, Ont.

Canadian Salt Company.—Licensed 17th July, 1901. Head office: E. G. Henderson, Windsor, Ont.

NEW BRUNSWICK.

Gold Zone Mining Company, Limited.—Incorporation to be applied for. Authorized capital, $350,000, in shares of $1 each. Head office: Rothesay, New-brunswick.

COMPANY NOTES.

Mikado Gold.—The accounts of this Company for the year ended 31st December last show: Receipts from bullion, £21,883 7s. 1d.; Rents, £280 19s. 6d.; London, £92 5s. 5d., general expenditure, £14,881 0s. 9d. (mining £6828 8s. 6d., milling £2891 8s. 7d., cyanide plant £2,238 16s. 1d.); depreciation written off, £3,987 4s. 3d.; expenditure in London, £1,485 5s. 10d.; net profit to balance sheet, £1,903 1s. 2d.

Ymir.—Cablegram from the company's representative at Nelson, British Columbia:—"Mine Car sample, level No. 4, west of the dyke—sample assays gold $35 (£7), silver $5 (£1) per ton of 2,000 lbs. Represented width of 15 ft. The average width of the vein is greater." The following circular has been issued to the shareholders: "Referring to the circular of 31st May last, the company's engineers have now fully reported the result of the cyanide operations, and they strongly recommend that the present small plant be supplemented by one sufficiently large to treat the whole of the tailings as they pass from the mill. The order for this plant has been given, and the work will be pushed on with all the speed possible. The installation of this plant will cost approximately £10,000, and, as the shareholders have already been informed, it will produce an estimated profit of not less than £17,000 per annum, equal to an additional 8½ per cent. on the Company's capital. The policy of the Directors in the past has been to pay for all additions and improvements out of profits of the mine. The shareholders will doubtless learn with satisfaction that the installation of the requisite cyanide plant will be made without any increase of capital and without entrenching upon the funds required for the payment of quarterly dividends. The news from the mine continues to be of the most satisfactory character, and the high returns are being maintained. It will be remembered that two interim dividends of 1s. each per share were declared on 28th January and 15th May of this year respectively, and the directors anticipate declaring another similar dividend early next month, and further quarterly dividends should follow in due course."

Asbestos and Asbestic.—The report of this company, recently issued from the London office, for the year ending March 31st, 1901, says that "the trading, after providing for directors' remuneration and all expenses in London and Danville, resulted in a loss of £6,964, from which has to be deducted the balance at credit of profit and loss brought forward from last account, £1,323, leaving a debit balance of £5,641. The serious loss is to be accounted for by the unfortunate fire at Danville, Quebec, in March, 1900, which proved more disastrous than was anticipated, and work was stopped for more than six months, and at that time of year when business operations should have been at their best. The production for the year has consequently been very small. The new plant put in has not a large capacity, but it is now working well, and the production of asbestos is immediately disposed of. There has been considerable disappointment in respect of the sale of asbestic in the United States, but in Europe the sale has continued to improve. The quantity of asbestic on dump in bulk has been reduced by 1,912 tons during the year, and now stands in the stock account at 47,402 tons.

"The endeavour of the board to induce the shareholders to find the necessary funds for the carrying on of the business of the company having failed, and Mr. James Graham Cannon, of New York (who, with Mr. William C. White, of New York, was elected a director of the company in June, 1900), having obtained control of the majority of the capital of the company, and having stated that he is prepared to find the necessary money to re-equip the mine, and to provide for the floating indebtedness of the company, including accrued directors' fees, on condition that the management of the company's affairs be entrusted to him, with the support and good-will of the shareholders, the directors resident in London will resign their seats on the board immediately after the meeting to be called for June 26th, and will carry out the necessary steps for the transfer of the company's affairs to a board which will be composed of Mr. Cannon and others to be nominated by him. The directors believe that the plans of Mr. Cannon and his friends are submitted for the purpose of benefiting the interests of the general body of shareholders, and are the means most likely to bring the business of the company to a successful issue within a reasonable time.

"Mr. Cannon, with his friends, holds the strong belief that, when properly equipped, and in view of the expanding market for its products, the property of the company will become remunerative, and in making the foregoing recommendation the board believes it is submitting a solution of the present difficulttes, which should prove of great advantage to the shareholders. The members of the board, other than Mr. Cannon and Mr. White, also wish to place before the shareholders their belief that, in evidencing faith in the ultimate success of the company by the investment of additional funds in the capital of the company, and by arranging to find funds with which to carry on and develop the company's business, Mr. Cannon has given the best possible guarantee that every effort will be made to place the company in a strong and profitable position. Mr. Cannon has promised that in raising the fresh capital necessary for the equipment of the property and the development of the company's business, he will offer the shareholders that capital and will give preference to their subscriptions to it."

Ruth Mines.—The directors' report says that two new claims have been added to the company's property, the purchase consideration being 30,000 shares. The capital of the company has, therefore, been increased from £120,000 to £150,000. There is reason to believe that these claims will prove a valuable acquisition. In addition to these the Blue Jay claim was acquired as being the most suitable site for the concentrator. The anticipations expressed at the general meeting, held on December 30th, 1898, have been partly realised and partly disappointed, but they were wholly postponed for a time by the occurrence of a strike on the part of the miners, which lasted for some nine months, and involved the complete shutting down of the mine. The strike came to an end in February last, but for some time afterward it was difficult to get the necessary number of men. Meanwhile the concentrator had been erected, and started work in the early part of the summer of 1900. It is working satisfactorily. The ore which has been treated in the concentrator has been taken partly from the backfilling of the old stopes and partly from the ore dumps. A large amount of development work will, without doubt, be necessary before the mine can be put into thoroughly good shape again, and the shipment of ore is at present limited to such an amount as will pay current expenses.

The directors regret to state that the development work upon the Aurora ledge has hitherto failed to prove the existence of ore bodies of value, and attention has therefore latterly been concentrated upon the original claims. A new discovery has been made upon the Hope claim, and a well-defined vein has been opened up by means of two tunnels, and a considerable body of ore has been revealed. As this new discovery lies ahead of the older workings of the property, it may be a continuation of the vein which has been cut off by the breaks in the formation, but it is at present impossible to speak with any certainty upon this point. Ore has been opened up in various parts of the older workings, and, generally speaking, the appearance of the mine is better than it has been since the fault was encountered. The most important development, however, has resulted from the driving of a tunnel to cut the vein at the fifth level, some 250 ft. below the fourth level. This extensive work, which necessitated driving a distance of some 1,200 ft., resulted in cutting the vein.

The accounts for the year ended June 30th, 1899, show a profit of £2,912. The accounts for the year ended June 30th, 1900 (for some eight months of which period the miners' strike was in operation), show a loss of £3,022.

Dominion Mining, Development and Agency Company, Limited.—The accounts for the 18 months ending December 31st, 1900, show that after charging expenditure on properties abandoned, loss on shares sold, and after writing off the balance of the Reindeer Skin contract, and the whole of the original purchase account, and after making a reserve of £24,162 against various shares held by the company, there remains a profit for the period of £1,257, which is subject to the realization of the various shares held at the prices at which they are taken for the purposes of the present account.

During the period under review the Kettle River Power Company, Limited, has been formed to take over the Cascade water rights and interest, and the company has received its proportion of the fully paid shares and part of the cash consideration for the sale. A company, under the title of the Gilbert River Gold Fields, Limited, has also been formnd to take over the property hitherto worked on a small scale by the Beauce Syndicate, Limited, and the company has received part of the fully paid shares coming to it under the terms of the sale. Latest reports from this property are most satisfactory.

The Queen Bess Proprietary Company, Limited, has been engaged upon the driving of the main tnnnel at a much lower level to meet the shaft sunk from tunnel No. 5, and the proceeds of all ores mined have been used for the development of this important work. The connection between the shaft and the main tunnel has been made. No. 6 level has been opened up in good ore for a considerable distance, and the engineer in charge of the mine intimates that shortly shipments from the mine will be greatly increased, while the expenditure on development will very materially decrease, so that the mine should at once be earning a surplus for dividend purposes.

With regard to the Atlin Lake Company, Limited, the shareholders have been advised from time to time of the development in connection with this property, and have forwarded to them copies of the various reports made upon same. Mr. Mostyn Williams, who is now returning to Atlin to commence the present season's work, has intimated that beginning washing the pay gravel in Birch Creek by June, a dividend-paying stage will be reached during the present season.

In order to carry through the various contracts in which the company is interested, to provide for the liabilities and to finance some of the subsidiary companies, the company has issued at par debentures to the amount of £10,000 in bonds of £10 each, for the term of two years, bearing interest at the rate of 10 per cent. per annum, payable half-yearly (first payment to be made October 1st, 1901) and secured upon the whole of the assets and undertaking of the company, with liberty to the company to redeem at any time after twelve months from March 31st, 1901, on giving 6 months' notice.

The following is a complete list of the company's holdings on December 31st, 1900: 5,948 shares of £1 each in the Queen Bess Proprietary Company, Limited; 20,875 shares, £1 each, Gilbert River Gold Fields, Limited; 18,269 shares (£1) Atlin Lake Company, Limited; 31,384 shares (£1) Kettle River Power Company, Limited; 5,250 shares (£1) Pyramid Copper Syndicate, Limited; 250 shares (£1) Anglo-Canadian Publishing Company; 80 shares ($10) Imperial Brewing Company, Limited; 33 debentures of $10 each in the Beauce Syndicate, Limited.

The mining properties include the following, all in various stages of development: Cromwell and Champion, two copper properties, situated at Pitt Lake, near Vancouver; two-thirds interest. I. C. Group, two silver-lead claims, known as I. C. and Vancouver, situated in the Slocan District, at West Kootenay; three-fourths interest, Alice, Romance and Condor, three copper and gold claims, situated on Hall Creek, West Kootenay; half interest. M. & M., a gold claim, situate on Wild Horse Creek; whole interest.

Cost of Diamond Drilling.

A short but interesting paper read before the Institute of Mining and Metallurgy gives in tabular form the details of a number of borings made with a 1¾-inch Sullivan drill, at the San Pedro mine, Fresnillo, Zacetecas, Mexico. The total depth of the hole was 1852 feet, and the actual time consumed in drilling was 2,480 hours. The rock was hard greyish blue slate, with seams of quartz and heavy spar. The total cost per foot was 6 shillings 7 2-10 pence ($1.64). Details of cost of labor, carbons, coal, bits, oil, etc., are given.

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The Governors of McGill University invite applications for the Professorship of Metallurgy. Candidates for the appointment are requested to send their testimonials, with a statement of age, qualifications, etc., to the Secretary of the University, before September 1st.

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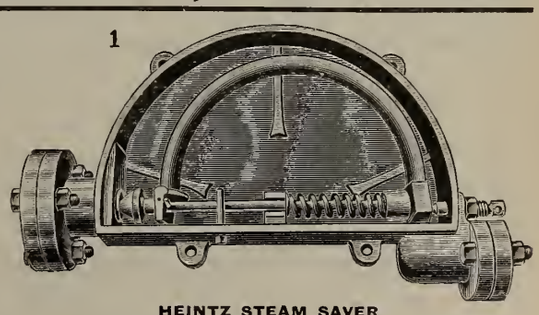

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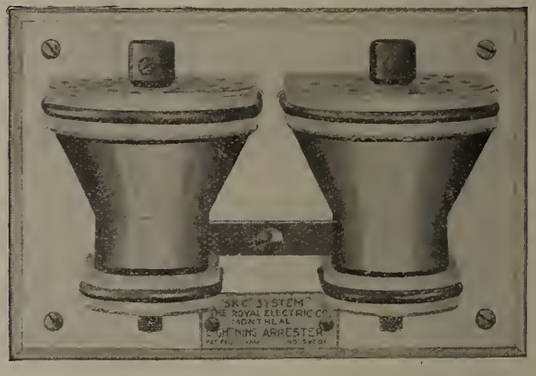

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THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite: copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

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Commissioner of Crown Lands,

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The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

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Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

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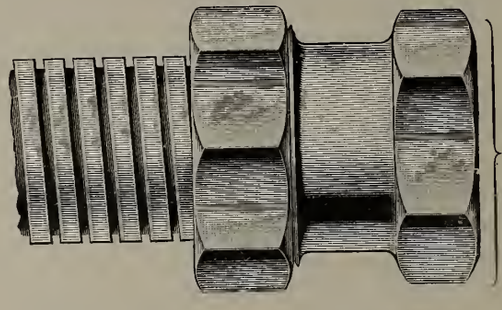

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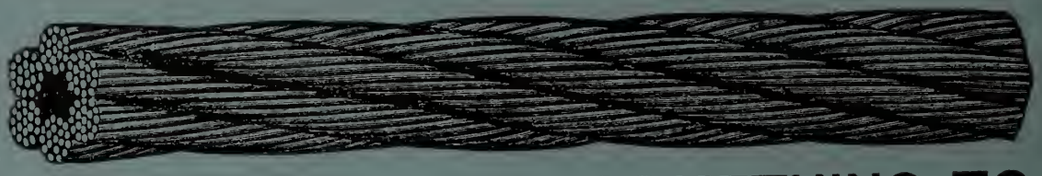

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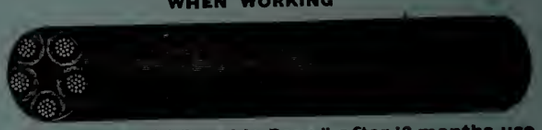

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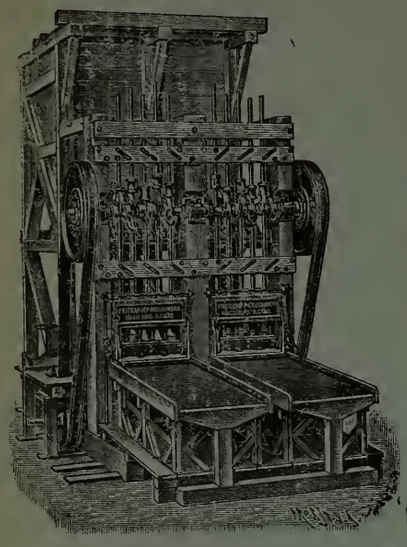

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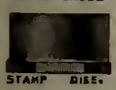

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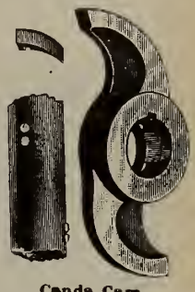

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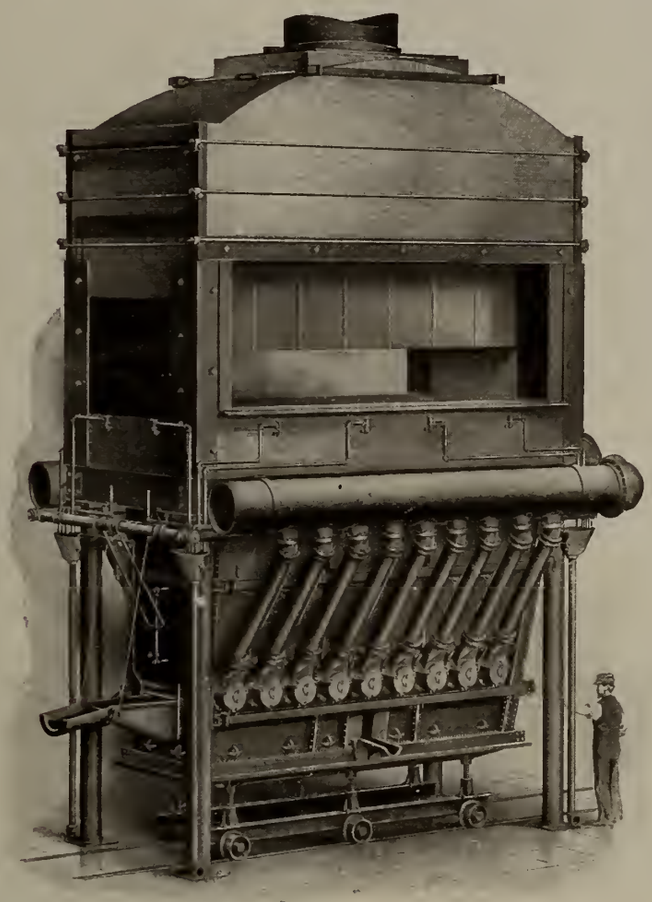

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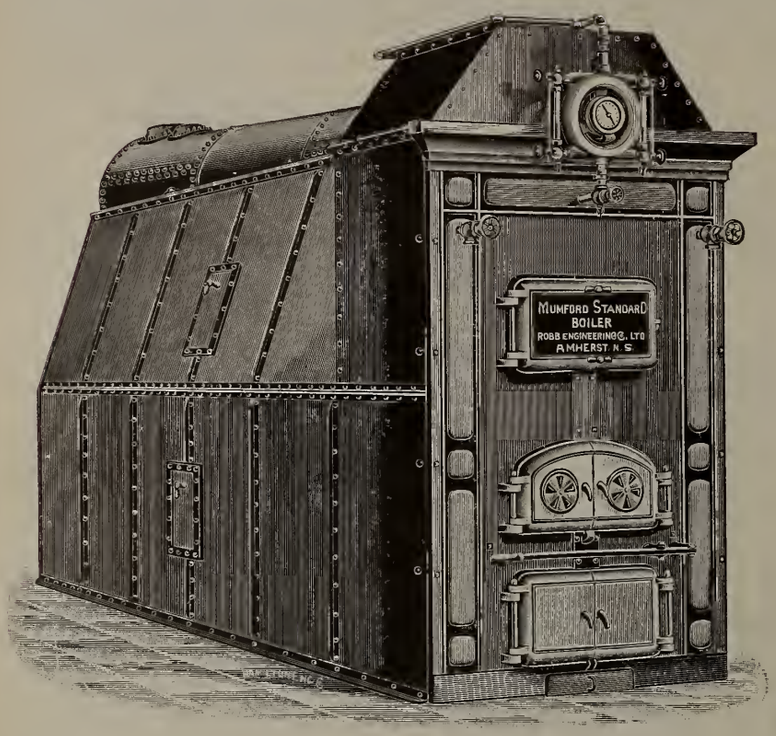

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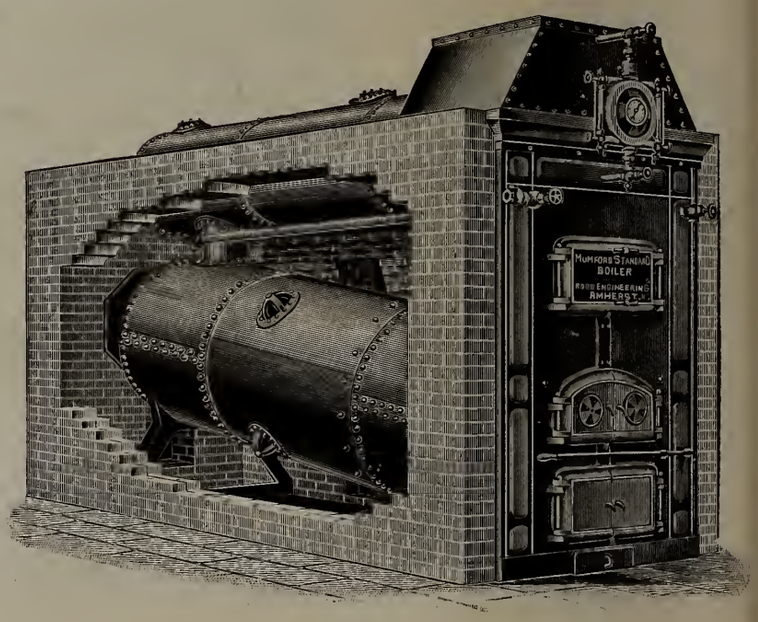

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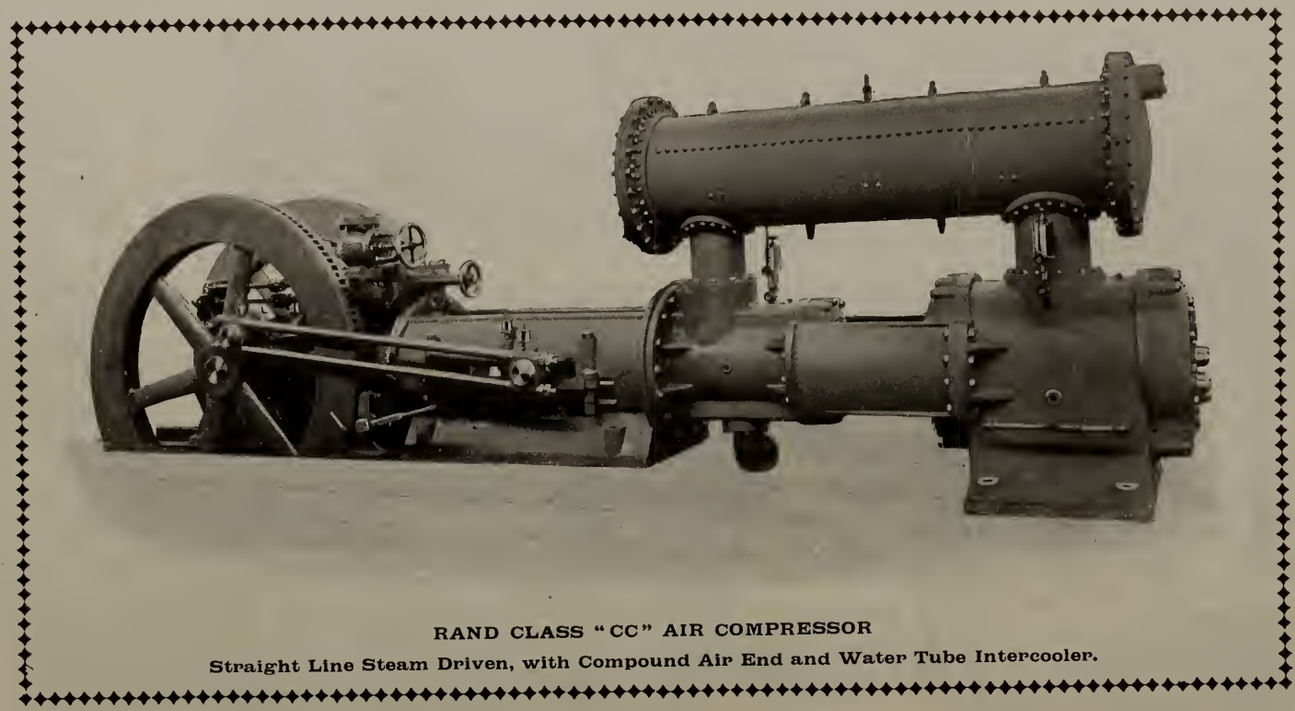

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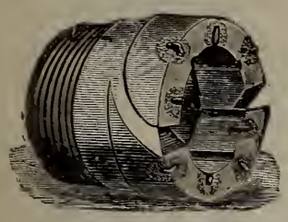

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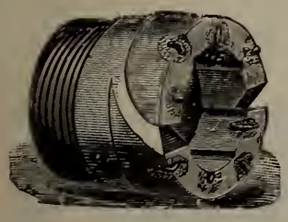

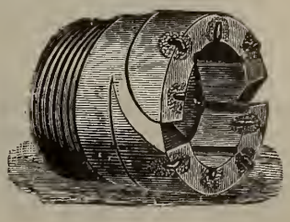

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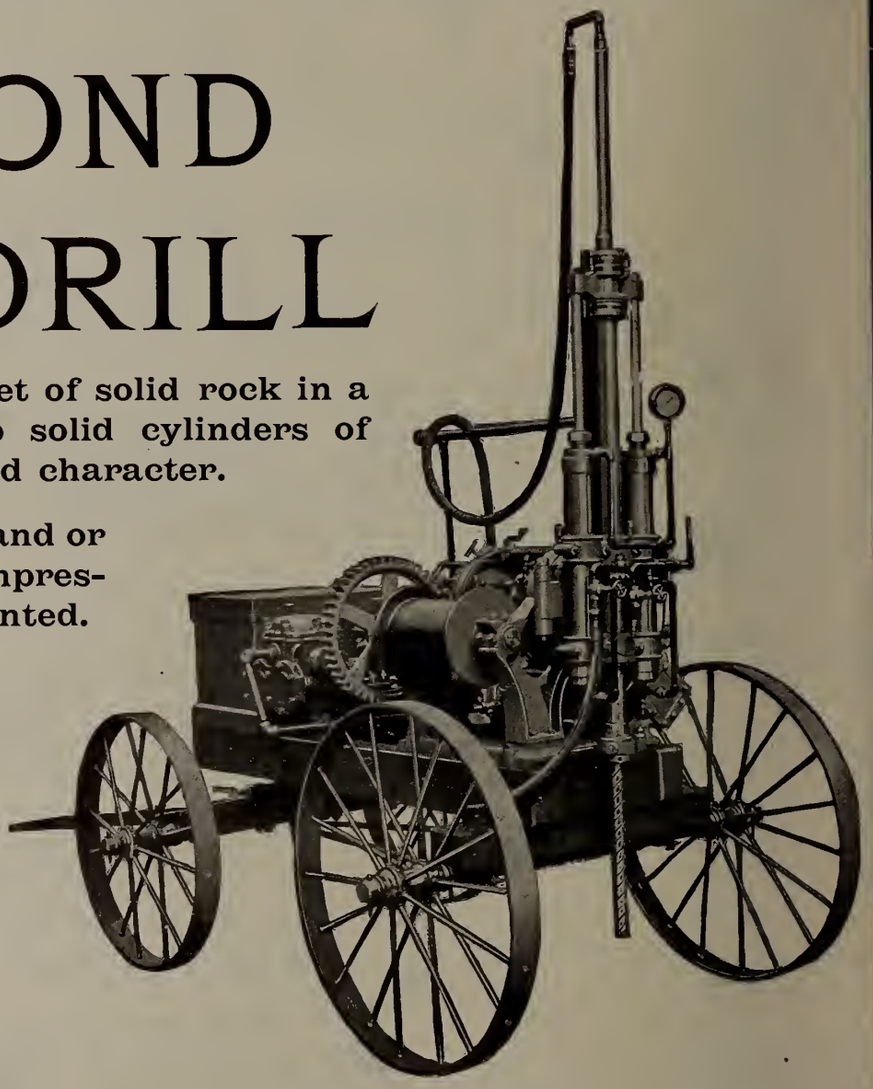

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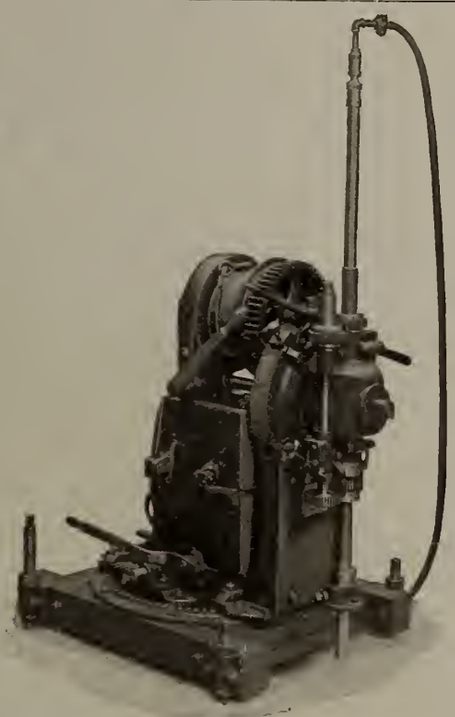

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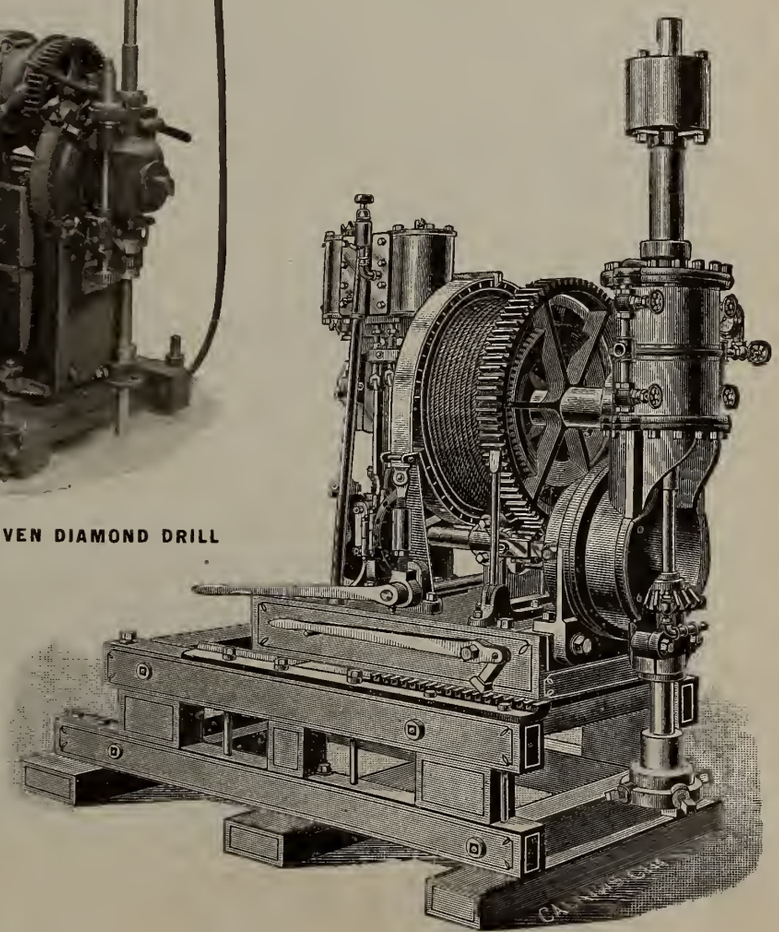

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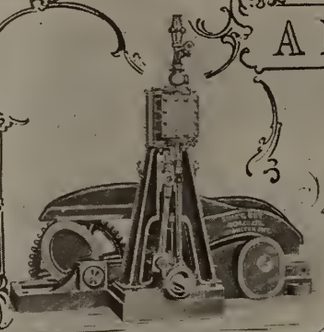
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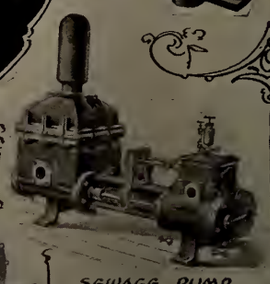
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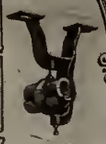

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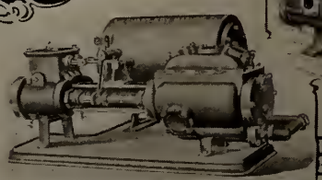
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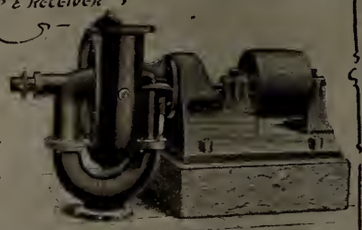
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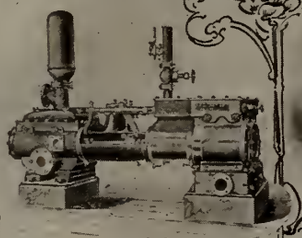

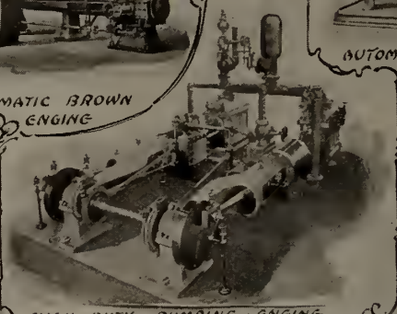
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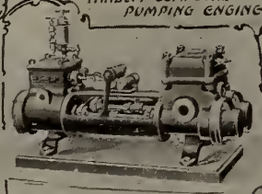
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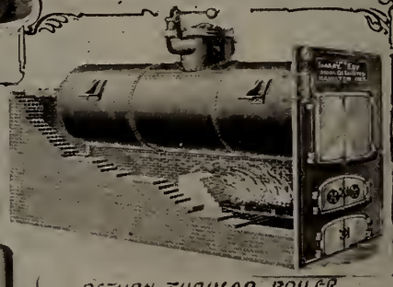
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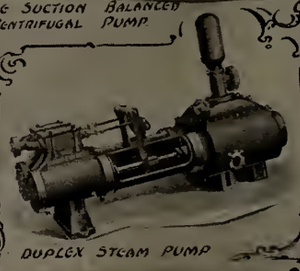
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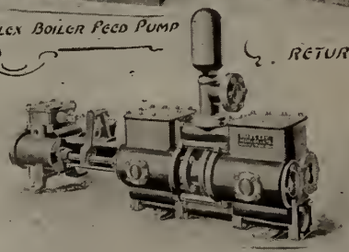
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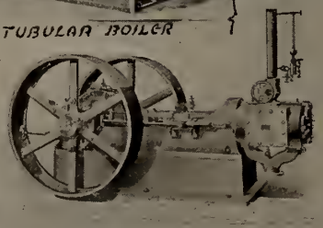
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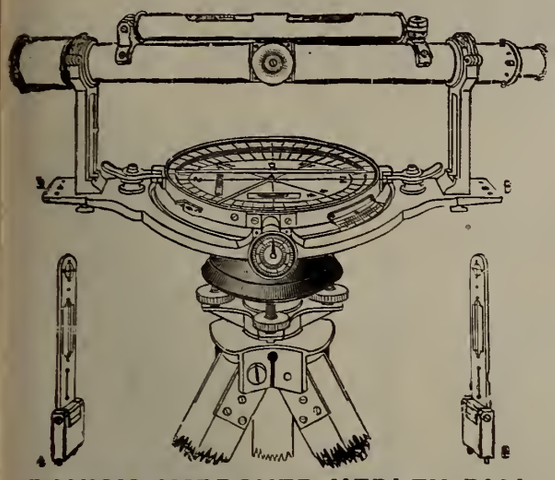

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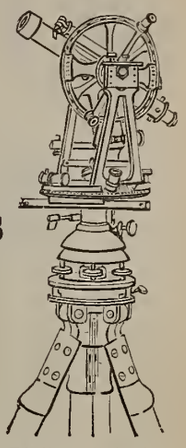

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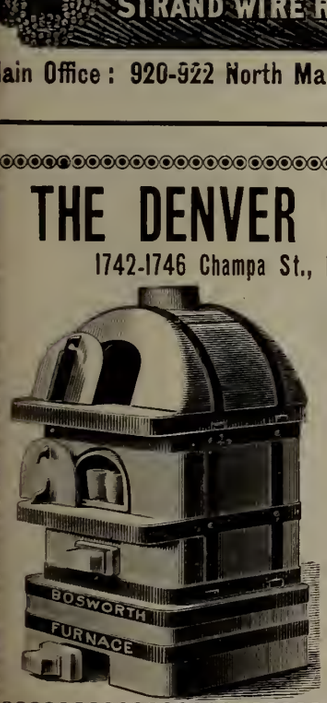

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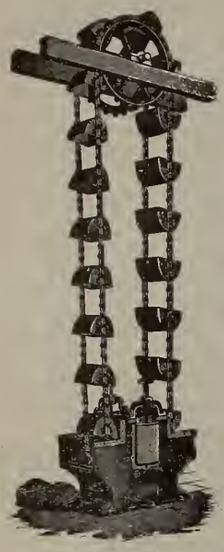

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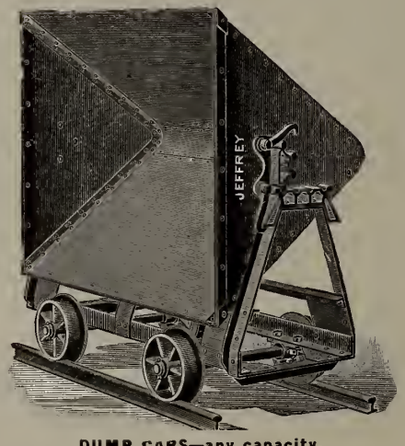

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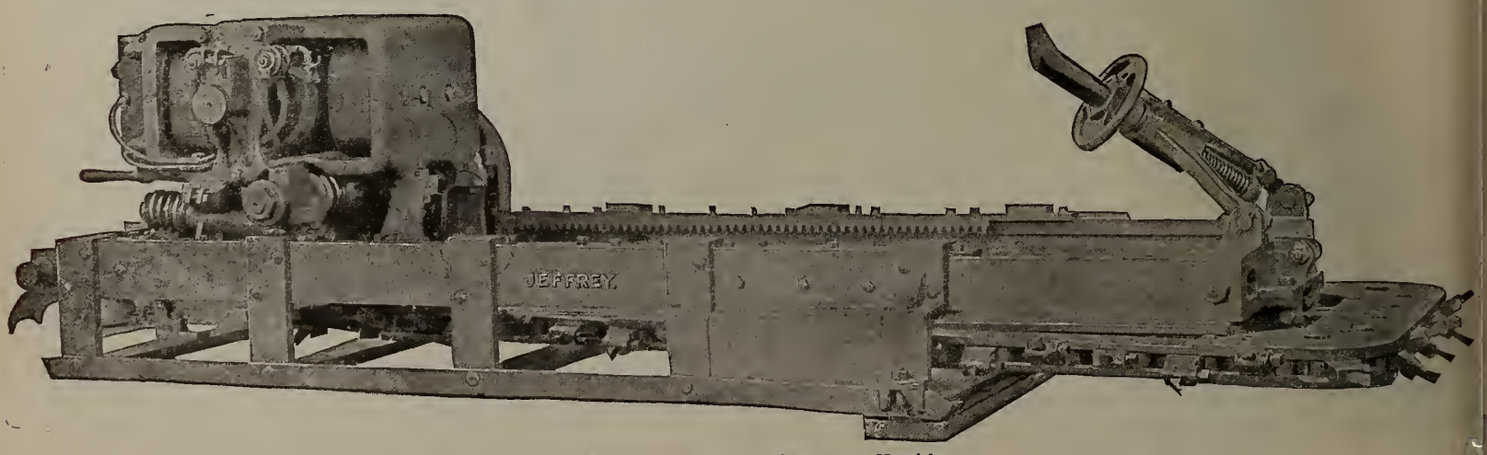

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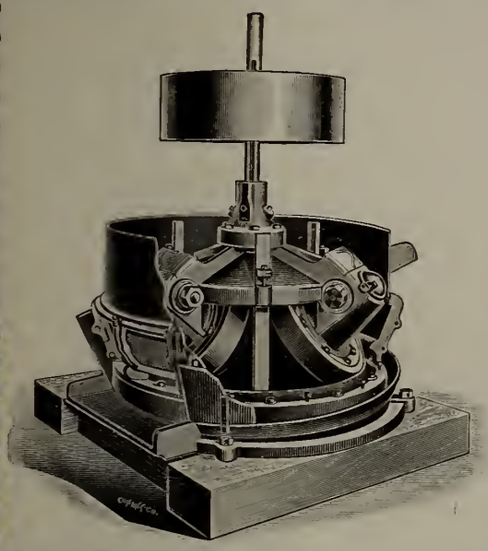

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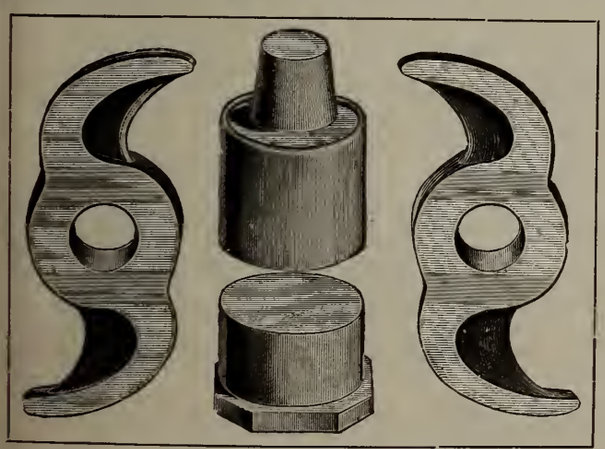

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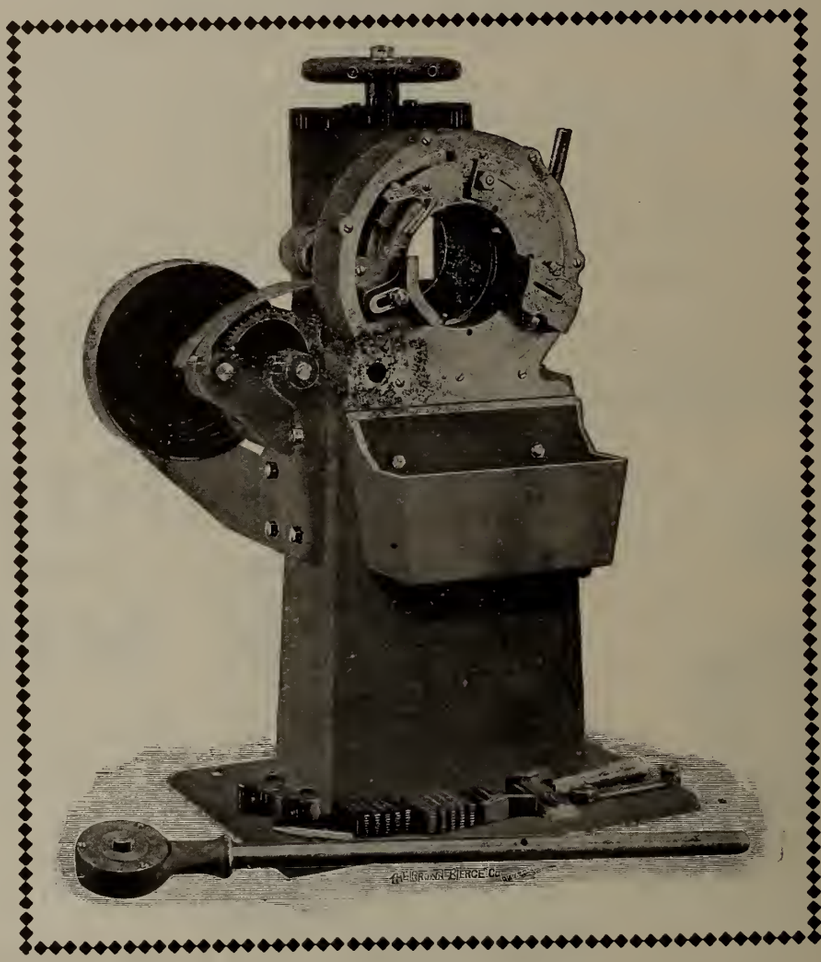

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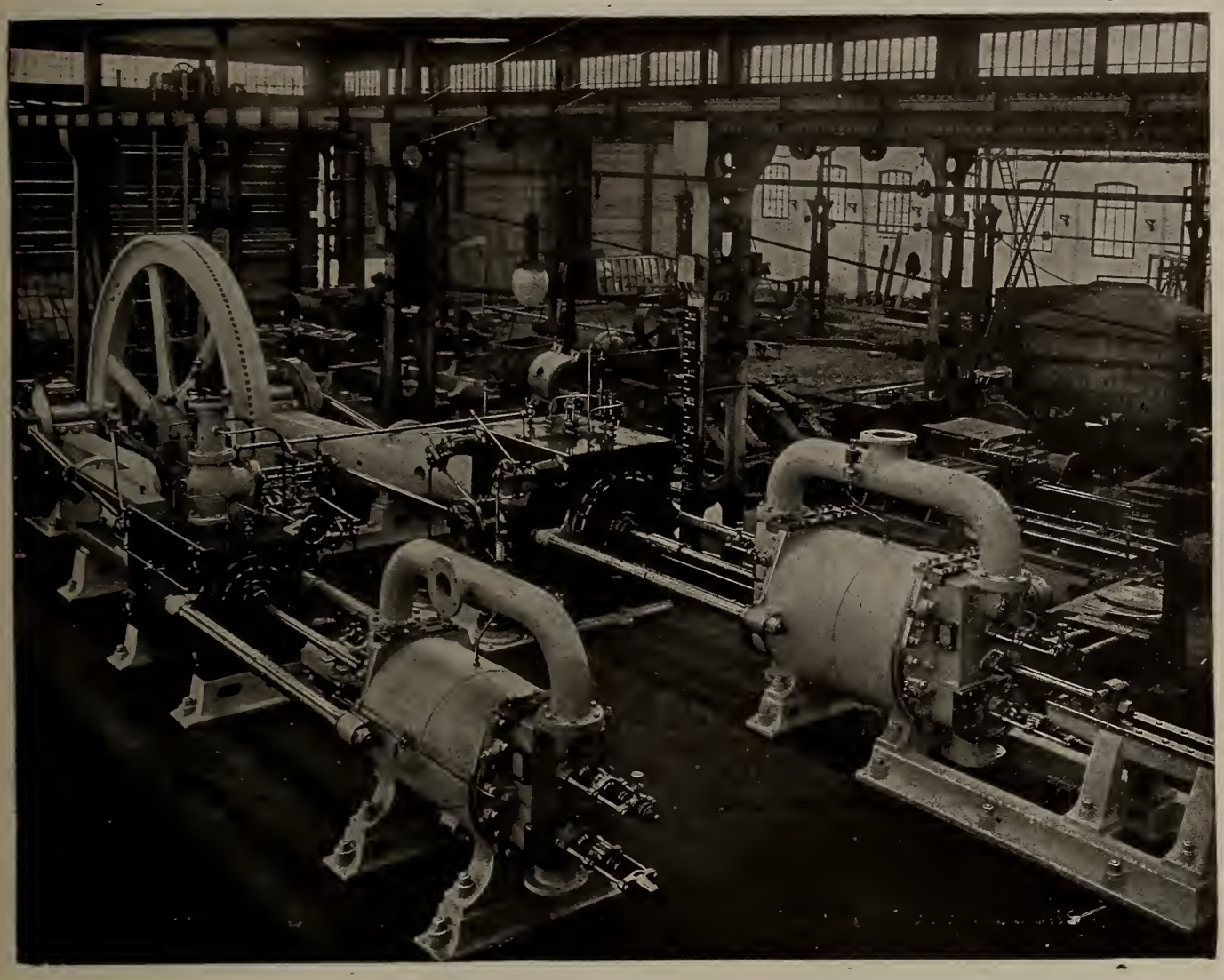
AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



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ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

RIO TINTO COMPANY

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THE BLACKWALL TUNNEL

For the construction of the Tunnel, **Six Air-Compressing Engines** were erected. The largest **Two Pairs of Compound Engines,** were supplied by us.

Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery :—

S. PEARSON & SON, Contractors.

Messrs. WALKER BROTHERS, Pagefield Ironworks, Wigan.

Blackwall Tunnel Works, East Greenwich, S.E.
May 10th, 1897.

Dear Sirs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. Moir.

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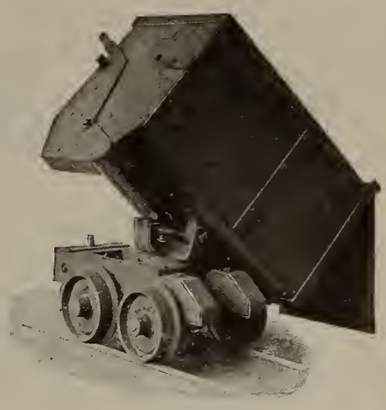

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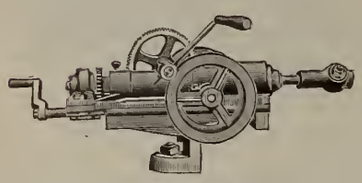

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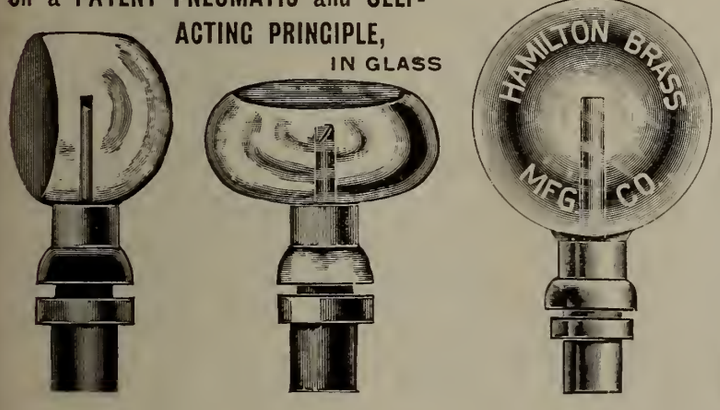

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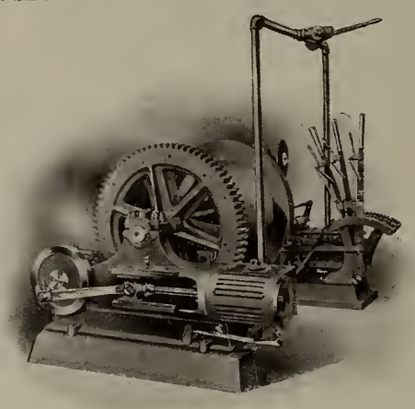

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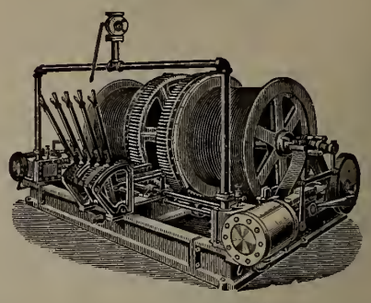

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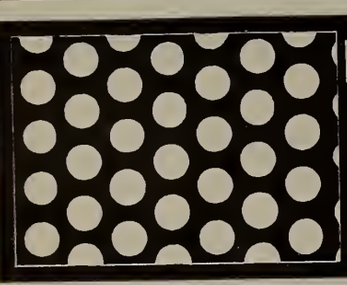

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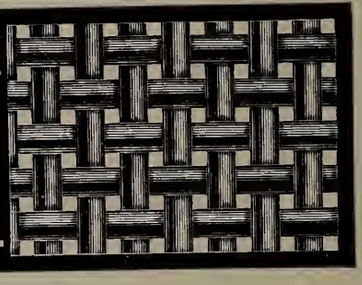

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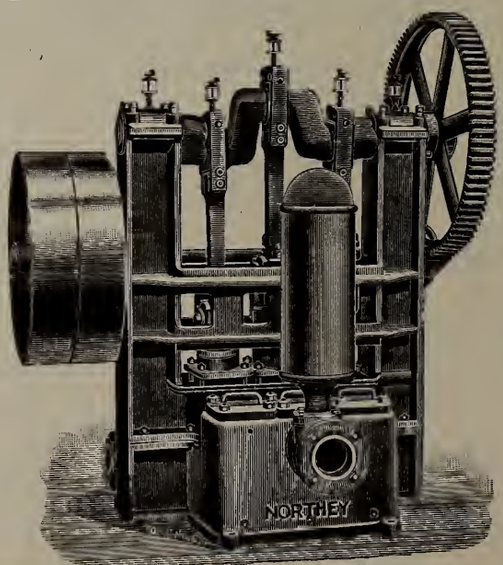
Pumps for Mine Work

Triplex Power Pump . . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

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Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 8. AUGUST, 1901. VOL. XX., No. 8.

Troubles in British Columbia.

The clouds which have hung over Rossland as a centre for several months burst in July with the not unexpected result of a strike on the part of the Rossland Miners' Union. The declared reason for this strike is sympathy with the smelter men at Northport, and for an increase of muckers' wages in Rossland of fifty cents per day. In consequence of the strike something like twelve hundred men were put into idleness, and up to the middle of August over 700 men had left that camp to seek work elsewhere.

It is claimed locally that the strike is purely the work of professional agitators, and that the vote to call out the men was "railroaded" through at the July meeting. At this meeting less than one half of the members of the Union were present, and the figures published seem to justify the statement as to the matter being in the hands of a clique; only 258 ballots, out of a total membership of some 700, were cast in favour of the strike. Up to the present time over 700 men have taken their packs and departed for fresh fields, most of the staff of the War Eagle and Centre Star Mines has been dispensed with, and the members have left the camp; the construction of the large addition to the Bonnington Falls power plant has been stopped; the large copper smelting furnace at Trail has had to be blown out, and a period of trade depression and uncertainty has been in full existence now for four or five weeks.

At the time of writing, no attempt for a settlement has been made either by the Union or the mining companies, nor is there any immediate hope of such an attempt. The managers of the large mines have authorized the statement that it is impossible for their companies to grant the advance, or to increase their expenses in any way, in the present condition of their mines. In the B.C. Government Mines Report (reviewed elsewhere), the average gross value of the ore shipments from Rossland in 1900, as figured by the REVIEW, was $10.72 per ton, that of the LeRoi Mine was $9.17 per ton, and the shipments from the War Eagle and Centre Star Mines (together) was $14.80 per ton. From the published reports of the companies named, and from the various statements that have appeared in the B.C newspapers relative to this strike, it is evident that the actual cost of this ore to the mines is not less than eight dollars, and probably equals $9.00 per ton, especially if all the costs, such as mining, transportation, smelting, management, marketing, depreciation and taxes are included, as they should be.

In view of these figures and facts, and taking into consideration that it is well known that no large bodies of high-grade ore have been encountered in development work, it is easy to believe that Messrs. Macdonald and Kirby have stated nothing but the truth when they said that the margin for profit now existing would be eliminated if they were to further increase existing expenses. Hopes for the resumption of work then must be confined to the expectation that the Miners' Union will recede from its position and abandon the strike; this view is intensified by remembering that the average value of the shipments from the Le Roi mine in 1900 was $9.17 per ton, and rumours have been brought east that the 104,000 tons shipped during the first half of the present year have averaged less in value than the shipments for 1900; if such rumours (which the REVIEW does not vouch for) are true, the LeRoi for this year has already lost the small margin of profit it had last year, and the strike may be a blessing in disguise to that company.

At this time, also, an organization called the British Columbia Mining Association has presented a memorial to His Excellency the Governor-General-in-Council, praying for the appointment of a Royal Commission to inquire into the conditions of excessive taxation and oppressive legislation existing in British Columbia, with a view to recommending measures for the relief of the mining industry of the Province. Inquiry at Rossland leads to the belief that this British Columbia Mining Association is the organization known as the British Columbia Mine Owners Association, and if such is the case its public utterances are entitled to very serious consideration.

The memorial is a lengthy document that has appeared in several papers in Eastern Canada, and been commented upon. To very briefly summarize the memorial, it begins the statement of its case by saying that the white population of the country before the mining excitement of the last decade amounted to 65,000 people; that in the year 1900 this white population had reached the number of 110,000. It then goes on to say that the prospectors of the Province have nearly all disappeared—"The flow of capital into the Province has been practically cut off; the metallic production is at present decreasing; numbers of producing mines have closed down, and those operating, with but few exceptions, have ceased to pay dividends." Commenting on this, it is fitting to observe that, during the period referred to in this memorial, the metallic production of the Province has increased from less than $600,000 a year to over $11,300,000 a year, a growth which does not strike the REVIEW as "decreasing" or at all discouraging. The statement that the prospectors have disappeared may be true of inland districts, but certainly is not true of the coast country, nor of the northern sections of British Columbia. The figures that we have just quoted give the emphatic lie to the statement that the metallic production is decreasing. The report of the Provincial Mineralogist for 1900 shows a distinct increase of over three millions in the metallic production *for the year*. This *inerease* is equal to 37%.

The memorial says this decline or "blighting of the industry is not due entirely to natural causes, but mainly to unwise legislation"; at the same time admitting that the industry of metal mining has suffered, amongst other causes, from "The ordinary elements of chance, over-valuation of prospective mines, stock swindles, bad management, etc., etc."

That the present condition of the industry in *Rossland* is retrograding, is undeniable; that this is due to legislation, wise or unwise, is very debateable. We do not fancy that the Association will argue that legislation at Victoria is responsible for the Miners' Union's existence, nor for the decreasing grade and uncertain quantities of Rossland ore. And, in fairness, we must point out that a study of the Minister of Mines' Report does not justify any statement that the mining industry is retrograding in other camps throughout the Province. The legislature cannot be held responsible for the depression in the silver-lead mines. While admitting the difficulties under which mining ventures have labored in British Columbia the REVIEW cannot see that they are due to any causes which are legitimately within the jurisdiction of the Dominion Government. We have no desire to approve of the eight-hour law, nor to minimise the effects that have resulted from that law, neither do we desire to uphold in any way the burdensome 2% tax on output which is oppressive to many of the mines; but we do desire distinctly to record the opinion that the rectification of these matters is necessarily within the sphere of the Province itself, and not to be supplied by the Dominion Government in any special form or manner. The Province itself, and the people in it, are to blame for any legislation which has been unwise, and also for "the over-valuation, stock swindles, and bad management" complained of in the memorial.

The columns of the REVIEW, during the past four or five years, have forecast in a measure the conditions which now obtain in some of the older camps By those competent to observe, and deduce conclusions, the operation of the natural law of cause and effect could have been seen as clearly years ago as it now is plainly felt, though it has been aided by the labor agitator and his followers.

The vague stories of fabulous richness have run their course and died a natural death; values have been ruthlessly cut down with experience; credulous (because inexperienced) capitalists, and the yet more credulous public, have been the prey of promoters and stock schemers, and loss of confidence in the mines of British Columbia was inevitable. So far as the Canadian capitalist is concerned, this loss of confidence has begotten violent condemnation of everything and everybody connected with mines, and the reaction is as grossly absurd as was the enthusiasm of three years ago; the foreign capitalist, however, who is no novice, has only been waiting for the shaking up British Columbia mines are now experiencing, knowing that when matters settle down values will be on an approximately equitable basis, and that mining can then be conducted in the same way as any other business.

No Royal Commission is needed, nor should it be issued. Hasty legislation at Victoria, burdensome taxes, and labor union troubles call for no outside investigation, but for strong and united Provincial efforts for their rectification. The Federal Government has done its part in giving such relief (in bounties) as was asked, but it cannot change the customs tariff for the benefit of any one particular Province, or any particular class of citizens. It is for the inhabitants of British Columbia to help themselves and to take such action as will rehabilate that Province in the favor of capitalists both at home and abroad.

The fourth volume of the Journal of Proceedings of the Canadian Mining Institute for 1901 was issued to the members on the 22nd instant. This volume is the largest yet published since the organization of the Institute.

Mining in Nova Scotia.

During the past six months mining operations have been carried on vigorously in Nova Scotia. In Cape Breton, the Dominion Coal Co., have practically bottomed their big shaft, and next season its production will be an important item. The development of No. 3 colliery in the Caledonia seam has been steadily pushed. As the coal in No. 4 sank in an underlying seam proved too thin to work, the mine was closed. The improvements effected during the past year in the plant of this company have resulted in increased outputs from all of their principal mines. The amounts of coal supplied to the Dominion Iron and Steel Company are steadily increasing, as additional furnaces are blown in.

At the Old Sydney Mines, the Nova Scotia Steel and Coal Company are working steadily both at their ovens and in the pit Preparations are being made to open up the Northern district which as yet is untouched. This will be reached by a branch railway from their present line. Boring operations are being continued by Mr. Roberts in the rear of North Sydney, and by Senator McKeen near Cow Bay. The results which are not yet made public are believed to be fairly encouraging.

At Mabou, some exploratory work has been done with a view of preparing for the extension of the workings under the sea. The Port Hood Coal Company are making good progress, and claim to have improved their shipping facilities so that good sized cargoes can be loaded without any difficulty.

At Broad Cove, the work of development by the Inverness and Richmond Railway and Collieries Company is being gradually extended. This company are now connecting their road with the Government system by a branch from Port Hawkesbury to Port Hastings.

In Pictou County the Nova Scotia Steel and Coal Company are opening a seam to the East of New Glasgow, from which they expect to take out about 200 tons of coal a day to supply their generators at Trenton. Otherwise, mining is rather quiet in the Pictou district. A good deal of interest is being taken in the prospect of finding coal beneath the overlying measures between New Glasgow and Pictou, and arrangements are being made for the services of one of the Government drills.

In Cumberland County work has been quiet during the past few weeks. The purchase of a large amount of coal by the Minister of Railways last spring has anticipated the ordinary supplies furnished by the mainland collieries. As, however, it is stated that the railway will require an increased amount of coal, this will probably be made up in the fall. The total sales for the six months amount to about a million and a half tons as compared with one million three hundred and fifty thousand tons during the same period last year.

The Dominion Iron and Steel Company have now two furnaces in blast, and are arranging to start the third in a few days. Some little difficulties incidental to the inauguration of furnaces under new conditions have been met, and are being overcome. Presumably they are due to the proper relationships of the fuel, ores and fluxes not yet being fully made out. The erection of steel works, plate and other mills is being hastened as much as possible, and every effort is being made to overcome the delays which have arisen in getting this concern in full working order.

The Nova Scotia Steel and Coal Company have continued working in Pictou County. A Government drill is at work now in the Whycocomagh iron deposits, in the hope that it will prove a cheaper and more prompt method of tracing the various deposits.

At Torbrook, in Annapolis County, the borings of the Government Diamond drill conducted by Messrs. Pearson and Brookfield

have demonstrated the existence of an iron ore field similar in quality to that worked in Newfoundland, and of enormous extent. So large does the amount of iron ore appear in this district, that the claim seems well founded that it is one of the largest in the world. Situated within 25 miles of tidewater, and on the line of the Central Railway it is unusually well situated for the export business.

There is little to report about gold mining. The returns as far as received would indicate that the output this year should be in the vicinity of 40,000 ounces, a material increase over the year 1900. The various mines which have been referred to in our columns have continued to work regularly. The approaching development of the Dolliver Mountain low grade deposits, which are a continuation of the well known Richardson reefs, leads to the hope that in the near future another large and prominent producer will be added to the list of Nova Scotia mines. Much interest has been taken in the discovery of extensive deposits of gold bearing quartz in the Nictaux district close to the iron fields.

The demand for building stone, plaster, limestone and bricks continues unabated, and all the properties handling these products are working steadily.

The Resignation of Professor De Kalb.

We are sorry that by the resignation of Professor De Kalb, professor of Mining and Metallurgy in the School of Mining, Kingston, Ontario, is to lose the services of one who has done much to assist in the steady and healthy growth of mining in that province during the past five or six years. During that period Professor De Kalb has devoted himself to his duties in the School of Mining with such energy and love of his work as to leave a lasting impress upon that vigorous institution. The mining laboratory at the School of Mining is one of the best equipped on the continent, and we understand that a large part of this equipment has been secured by Professor De Kalb among his personal friends in Canada and the United States. In addition to his duties as professor of Mining and Metallurgy, he has also acted as Inspector of Mines for Ontario. This office he also now resigns, after getting to himself the credit of making mine inspection in Ontario a reality. His wide experience in mining operations enabled him to be of great service, not only in protecting miners from the dangers of careless or incompetent management, but in giving valuable suggestions as to mining methods. It will be difficult to replace Professor De Kalb in the two offices which are now vacant. We wish him every success in the work of consulting mining engineer, which he now resumes.

Mining Progress in British Columbia.

The report of the Minister of Mines for British Columbia for 1900 is fully equal to its predecessors in both form and value, and is particularly interesting at the present time in view of the Memorial recently addressed to the Governor-General-in-Council by the British Columbia Mining Association, is noticed on another page of this issue. The total gross value of the minerals produced in British Columbia in 1900 was $16,344,157, the value for 1899 was $12,393,131, showing an increase for 1900 of $3,951,020, or 32 per cent.

Nearly one half of this large increase comes from the abnormal production of lead, which amounted to 41,496,183 lbs. in excess of the production for 1899, being 63,358,621 lbs. against 21,862,436 lbs. The value of the increase is given as $1,813,017. The production of silver was 3,958,175 ozs, an increase of 1,018,562 ozs. or 39 per cent. more than the production for 1899, and 3 per cent. less than the yield for 1898; the increase was valued at $645,492

Gold won from placer mining decreased $66,000, but that obtained from vein mines increased $595,000, making a net increase of $529,632 or 12 6/10 per cent. To this increase the Cariboo District contributed $303,000 (largely from the successful year of the Consolidated Cariboo Hydraulic Company), Nelson Division of West Kootenay added $311,000 (chiefly the product of the Ymir and Athabasca mines), Trail Creek (Rossland) showed a small increase of $178,000 and the Boundary Creek country $145,000 from the gold contained in the ores smelted there; from the total of this increase must be taken the very large decrease in the Cassiar and Atlin Lake districts which amounted to $350,000.

Copper shows an increased output of 2,274,489 lbs. of a value of $263,836, or 29½ per cent. increase in quantity, and 19½ per cent. increase in value, over the figures for 1899. The factors accompanying this increase are the most significant in the Mines Report. The amount of metal produced in Boundary Creek from the furnaces started during the year is valued at $918,325, the Vancouver Island Districts show an increase of $240,582; at Rossland the production declined in amount the sum of $661,000 and in Nelson Division (due to the temporary closing down of the Hall Mines) there was a decrease of $234,000.

Of the total production for 1900 Yale District (Boundary Creek) produced 5,672,177 lbs., the Coast District 2,193,962 lbs and Trail Creek (Rossland) 2,071,865 lbs.; in 1899 Rossland produced 5,693,889 lbs., which was 74 per cent. of the total copper produced that year in British Columbia, but for 1900 the percentage amounts to only 20; Rossland's production for 1900 is 36 4/10 per cent. of the copper produced in 1899, so that no longer can Rossland be considered as the principal copper camp of the province, and, upon considering Mr. Robertson's valuable figures contained in his "Notes of Progress," it is difficult to call it a copper camp at all as its values are almost entirely in gold. The average amount of copper in Rossland ores in 1900 was about nine pounds per ton, whereas in 1899 there were 33 lbs. of copper to the ton of ore; the average gold contents were $10.60 in 1899 and $12.30 in 1900. The 103,426 tons of ore smelted from the Boundary Creek country during 1900 averaged 54 lbs. of copper and $3.60 in gold to the ton. The amount of silver contained in the ore is very small, averaging from ¾ of an ounce to 1 ounce to the ton. Another significant item among these figures is the increase of 26 per cent. in the tonnage output from Trail Creek district (some 44,971 tons) with a decrease in total values of $489,786, making the percentage decrease about 33 per cent., or a fall from $18.70 in 1899 to $12.60 per ton in 1900.

In combustibles, coal shows an increase of 133,271 tons, of a value of $399,813; coke increased some 50,000 tons, of the value of $254,490. The increase therefore in coal and coke is 184,169 tons and $654,303, or 16 per cent. over 1899.

The increases (in dollars and cents) with the percentages of the total increase are shown in the following tabulation:—

Lead	$1,813,017	45.9 per cent. of total increase.	
Coal (and Coke)	654,303	16 6	" " "
Silver	645,492	16.3	" " "
Gold	529,632	13.4	" " "
Copper	263,836	6 6	" " "
Other materials	43,340	1.2	" " "
	$3,951,620	100 0	

The percentage of the total increase credited to lead is noticeable, and is explained by the large production from East Kootenay district, which, in 1900, produced 37,500,000 lbs. more of lead than in 1899, thus accounting for $1,606,970 of the $1,813,017 total increase in lead; nearly 90 per cent. of the increase in silver also comes from this dis-

trict, $541,000 of the total increase of $645,000 being East Kootenay's share. But, while crediting East Kootenay fairly with its part of the large total, one must not forget that the low percentage of silver in the lead is also due to this district. In 1899, taking the production of the whole Province of British Columbia, there was 1 oz. of silver to every 7$\frac{1}{6}$ pounds of lead; in 1900 there was 1 oz. of silver to every 16 lbs. of lead; but in the district of East Kootenay there was only 1 oz. of silver to every 40 pounds of lead, or, putting it in smelter's language, in 1899 there were about 2$\frac{7}{6}$ oz. of silver to the unit of lead, in 1900 1$\frac{1}{4}$ ozs. to the unit of lead, and for the East Kootenay district only $\frac{1}{2}$ oz. to the unit of lead.

The general result obtained from a study of these figures and of this report is one distinctly favourable to British Columbia. It proves that the mineral industry is progressing in a manner which, if not specially noteworthy, is nevertheless satisfactory, and it renders incomprehensible the pessimistic reports which have emanated from the Province during July and August. A review of a government report is not the proper place in which to discuss these reports or the remedies suggested, but we have alluded to them elsewhere.

The prohibition of the entrance of silver-lead ores into the United States, which happened at the beginning of the year and was solely caused by the monopoly called "The American Smelting & Refining Company," has created a tremendous depression in silver-lead circles and properties, which is not likely to be removed this year. Notwithstanding, there is every probability of a larger increase of gold production and a substantial increase in copper for 1901.

Notable developments are also making in the coal and iron interests of the province. The discovery and exploitation of deposits of high grade hematite along the line of the Crow's Nest Railway will soon lead to a larger consumption of both coal and coke. In short, the only danger that threatens the steady advance in mining in British Columbia are of man's invention and not of nature's placing.

Mining Legislation in B.C.

The following measures affecting mining were passed by the Legislative Assembly for the Province of British Columbia during the session 1901:—

INSPECTION OF THE METALLIFEROUS MINES.

Bill No. 28, an Act to amend the 'Inspection of Metalliferous Mines Act,' and amending Act provides for the appointment of an inspector or inspectors of metalliferous mines, who shall have had at least seven years practical experience. The provincial mineralogist shall have the powers and may exercise the functions conferred on an inspector of metalliferous mines by the Act.

The Act further provides that accidents must be reported forthwith to the Minister of Mines and to the inspector of the district in which the mines is situated. A monthly return is required to be made to the Department of Mines, setting forth the name of the mine, its extent, the name of the company or person operating it, the quantity of ore treated and any other particulars deemed necessary by the Minister of Mines. The Mine Recorder is to be notified of the shipping or the treating of ore from or at any mine.

The Act includes a new code of mine signals, to be known as the British Columbia Code of Mine Signals.

It is further provided that from and after the 1st of January, 1902, no person shall be allowed to operate for more than 8 hours in every 24 hours any first-motion or direct acting hoisting engine, any geared or indirect-acting hoisting engine at any mine employing 15 or more men underground, where the duties of a fireman are performed by the engineer in charge; nor shall any stationary engineer be allowed to operate a stationary engine developing fifty or more horse power where such engineer has charge or control of a boiler or boilers in addition to other duties performed by him. This Act shall not, however, apply to such steam plants as are in continuous operation or as are operated 20 or more hours in the 24 hours.

INSPECTION OF STEAM BOILERS

Bill No. 31, an Act respecting the 'Inspection of Steam Boilers and Engines and the Examination and Licensing of Engineers in charge of Steam Boilers and Engines,' includes within its scope all steam boilers operated in the Province of British Columbia, excepting railway locomotives on railways under the supervision of the Dominion of Canada; boilers subject to inspection under the Dominion Steamboat Inspection Act and boilers with a capacity of two-horse power or under.

It is provided that the Lieutenant-Governor in Council may constitute the Province of British Columbia into a Steam Boiler Inspection District or as many districts as he may deem proper. The Act provides for the appointment and qualifications of inspectors, who shall form part of a board to be called the Board of Steam Boiler Inspection, for the inspection of boilers, for the imposition of penalties for constructing or operating defective boilers, for the providing of steam gauges, water gauges, try-cocks, blow-off connection, feed water arrangement, brick flues, fusible plugs and other parts of the equipment, and for the qualification and classification of engineers.

Provision is made that the owner of every boiler within the scope of the Act shall pay yearly fees amounting to not more than $5; these fees to form part of the consolidated revenue of the province.

The Lieutenant-Governor in Council is authorized to make rules and regulations for the inspection of steam boilers and for the examination of persons in charge of same. All rules and regulations made under the authority of this section shall, after publication in the *British Columbia Gazette*, have the same force as if incorporated in the Act. (a)

REGULATION OF COAL MINES.

Bill No. 47, an Act to amend the 'Coal Mines Regulation Act,' provides for the addition to that Act of a chapter dealing with the examination of coal miners, fire bosses, overmen and shot lighters. It is provided that no person shall be employed as a coal miner, fire boss, overman or shot lighter in any coal mine who is not in possession of a certificate of competency as such in the form set forth in the Act. Certificates of competency are to be granted by a board of five examiners, to be constituted at each mine. Such boards shall consist of the following persons: (a) One appointed by the Lieutenant-Governor in Council; (b) two to be appointed by the owners or managers of the mine; and (c) two coal miners actually working in the mine and who shall have at least three years' experience as working miners, and after the going into force of this Act, possessed of the certificate of competency as such. Such coal miners shall be elected by the coal miners actually working in a mine. It is provided that the two coal miners who act on the board of examiners for the first year after the coming into force of the Act shall not be required to hold a certificate of competency.

The members of the board are to hold office for one year or until its successors are appointed.

No certificate of competency shall be granted to any coal miner, fire boss, overman or shot lighter who does not satisfy the majority of the board of examiners that he is sufficiently conversant with the English language and with the provisions of the Acts relating to coal mines and rules and regulations made thereunder as to render his employment as such safe. In order to qualify for a certificate a coal miner must have been employed in a coal mine for at least 12 months previous to the date of his application for the certificate; he must have a sufficient knowledge of the methods of coal mining to render him competent to perform the duties appertaining to his employment; and if he is a shot lighter, fire boss or overman in addition to the foregoing,

he must have a good knowledge of the character and effects of explosives and must be fully competent to perform his duties.

The Lieutenant-Governor in Council is authorized to issue from time to time regulations and forms for carrying out the provisions of the Act, such regulations shall, after publication in the *British Columbia Gazette*, have the same effect as if incorporated in the Act.

Every owner, agent or manager of a mine who gives charge of a working place to any person who is not a holder of a certificate of competency, and every person who obtains or seeks to obtain such employment by means of a false or fraudulent certificate shall be guilty of an offence under the act. Every owner, agent or manager of any mine or any person who refuses to allow coal miners to hold a meeting to elect examiners, or who in any way interferes with the working of the Act, is also guilty of an offence under the Act.

The Lieutenant-Governor in Council is empowered to authorize the payment of all necessary expenses for carrying out the provisions of the Act from the consolidated revenue of the province.

STORING OF EXPLOSIVES.

Bill No. 100, an Act to amend the 'Explosives Storage Act,' does away with all express exemptions from the operation of the Act, excepting the exemption respecting magazines or stores for the naval or military force. The exemptions heretofore included magazines in connection with coal mines and railways. It is provided that the cases in which powder magazines may be kept within the town or city shall include mines actually existing or become established within any city or town or within two miles of the limits thereof. In such cases, however, the magazine must not be within one-quarter of a mile of any inhabited house, and, in case of any dwelling being subsequently built within that distance, such must be made absolutely safe by natural mountains or hills or by artificial mounds of sufficient height and thickness, and the inspector of mines for the district shall first certify that such magazines comply with the requirements. The Lieutenant-Governor in Council may from time to time grant such special licenses for the erection and maintenance of powder magazines otherwise prohibited by the Act at such places and upon such conditions as shall appear expedient.

Conciliation in Nova Scotia.

On June 25th a settlement of the differences between the miners in the employ of the Nova Scotia Steel and Coal Co. and that company was affected at Sydney Mines under the Canadian Conciliation Act. Some time ago the Provincial Workmen's Association, which is composed of miners in many of the most important centres of Nova Scotia, made a demand on the employers of local mines for an increase of 22 per cent in the rate of wages paid to miners, to take effect in part in January and May of the present year. Also an increase of 50 cents per day to mechanics and 25 cents a day to ordinary labour employed about the mines. This demand was based upon the increased price of coal, which had been considerable during the previous year. In some of the mines this demand was conceded in part by employers without any serious conflict arising. In others the demands were met or compromised only after a strike had been inaugurated. In the case of the men belonging to the Dominion Iron and Steel Co., of Sydney, the matter was submitted to arbitration under the provisions made in the Miners' Arbitration Act of the province. A board of arbitrators was appointed and evidence given before this board by both the employers and the men. The board rendered its decision on April 25th last, and the decision given was in effect that in view of the position of the company the demands made upon it could not be granted.

The mines of the Nova Scotia Steel and Coal Company are opposite those of the Dominion Iron and Steel Company on the other side of the Sydney Harbour. At the time at which the employees of the Dominion Iron and Steel Company submitted their cause to arbitration under the previous Act, the employees of the Nova Scotia Steel and Coal Company made an appeal to the Honorable the Minister of Labour for the intervention of the Department of Labour to effect a settlement between the company and themselves under the Conciliation Act of the Dominion. In their communication to the Minister of Labour the employees pointed out the nature of their demands and stated that they were anxious to effect a settlement of these without the necessity of having recourse to a strike and suggesting that the minister should lend the friendly offices of the department to bring about an amicable adjustment of their claims. The communication was signed by a committee of the employees of the mines of the company, some 700 in all.

On receipt of the communication from the miners' committee, the company was informed of the contents of the communication, and the letter sent to the company contained the statement that the Honorable the Acting Minister of Labor was pleased to offer the services of his department in order to prevent a possible serious industrial dispute between the company and its employees and to effect the bringing about of a settlement in regard to the rates of wages in question which might be satisfactory to both parties, and the company was asked to signify its willingness as to the acceptance of the friendly offices of the department in the matter. After a brief consideration of the letter of the department, with which was enclosed a copy of the Conciliation Act, the company replied that it was agreeable to the intervention of the department under the Act.

As soon as a date convenient for a conference of all parties was arranged, Mr. King, the Deputy-Minister of Labor, left Ottawa to effect such settlement as might be possible after conference with the interested parties.

Mr. King arrived at North Sydney on the 21st, and on the day following met a committee of the miners at Sydney Mines and had their claims submitted to him and explained by the committee. He left on the following day for New Glasgow, where the head office of the company was located, and met there the managing director, the manager and the general superintendent of the company. These gentlemen reviewed briefly the position of the company in regard to the demands of the men and submitted evidence in support of their contention. It was shown that considerable advances had been made to a number of mechanics since the beginning of the year, some of which were in excess and others equivalent to the demands being made. Attention was also drawn to advances in the nature bonuses which had been made to the miners after the time at which their demands had been preferred.

The company maintained that the Dominion Iron and Steel Company, which had its mines in the near vicinity, was a keen competitor, and that the arguments which weighed in favour of the contentions of that company at the time at which the demands of its employees were submitted to arbitration under the Provincial Act, applied to a degree in its own case. It was then proposed that the rates of wages obtaining in the mines of the Dominion Iron and Steel Company should be made a basis for the rates to be paid to the employees of the Nova Scotia Company. The managers agreed to this proposition as a basis of settlement, and Mr. Fraser, left New Glasgow with the deputy-minister to discuss the proposal with a committee of the men at Sydney Mines. The company's proposition was then presented by the deputy-minister to the men's committee, who accepted it as entirely satisfactory. A question was raised as to the allowing of the payment of the amount due as a bonus in case in cases where men had worked less than the specified number of days for which the company had required work before allowing payment of the

bonus. It was argued by the men that where men worked less than twenty days in the mine they could not under the existing arrangement claim a bonus on any part of the work performed during any period less than the twenty days, notwithstanding the fact that absence from the mine during a part of the time might have been due to unavoidable causes. The company agreed to remedy this by making a provision that where satisfactory evidence was produced to show that a miner had been absent from work through causes over which he had no control, as, for example, sickness or other reasonable cause, he should be entitled to the amount of the bonus on so much of the coal as had been mined during the time at which he was employed in the mine.

A comparison was made by the deputy-minister from the books of the company of the rates being paid to the employees of the two companies, and, where obvious differences were pointed out, the company thereupon agreed to raise their rate in accordance with their previous agreement. As to the other rates, it was provided that these should be adjusted by the new resident manager, who at that time was the assistant manager at the mines of the Dominion Iron and Steel Company, and who on the week following was to be resident manager of the Nova Scotia Company's mines.

To secure the satisfactory carrying out of this agreement, and to prevent the possibility of future differences in regard to the same assuming serious proportions or giving rise to a strike or lock-out, it was agreed by both parties that the resident manager should at all times be prepared to meet a committee of the men to discuss with them any matters relating to the condition of their employment. If the conference with the resident manager did not afford a satisfactory explanation or settlement of the differences, the men's committee were to meet the general manager of the company in conference with the resident manager. In the event of a difference still existing, the point of difference or the question in dispute was to be referred to arbitration. Three arbitrators were to be appointed, one to be chosen by the employees, a second by the company, and the third by joint agreement of the two representatives already chosen, or, failing an agreement on their part as to the third arbitrator, the latter to be appointed by the Chief Jusrice of the Province of Nova Scotia. To prevent unnecessary recourse to arbitration, and to secure as much fair play to each side as possible, it was agreed that the party against which the decision of the court might be made should pay the costs of the arbitration.

The nature and the terms of the settlement having been fully explained and concurred in by each of the parties separately, a joint conference of the representatives of the company and of the men was held, at which the whole matter was reviewed by the deputy-minister in the presence of both and there agreed to. The new resident manager was also given his instructions in accordance with the terms of the agreement by the general superintendent of the company in the presence of the deputy-minister.

In the effecting of this settlement the task of the representative of the Department of Labor was a comparatively easy and pleasant one, owing to the evident disposition on the part of the employees to come to a settlement on a fair basis and a no less evident desire on the part of the employers to meet their employees in a friendly manner and to deal fairly with them. Neither party were desirous to have recourse to arbitration if a settlement could be effected without, although each had expressed a willingness to so submit the matters in dispute if necessary, and it was doubtless owing to the latter disposition that a settlement, through conciliation alone, was so speedily brought about.

The *B.C. Mining Review*—a sheet published in London—gravely nforms its readers that a "*ledge* of mica *thirty feet in thickness* has been uncovered on the Columbia River." Rubbish like this makes old-time mica miners blink.

EN PASSANT.

Judging from the returns already received at the Mines Office, the gold output for Nova Scotia for the fiscal year which ends on 30th next month, promises to be the largest in the history of that industry. This field, as we have repeatedly pointed out in these columns, is deserving far greater attention than it has hitherto received from outside capitalists.

From this office there was issued on 15th instant another volume of the Canadian Mining Manual and Mining Companies' Year Book, being the eleventh annual issue of this standard work of reference. The volume contains a mass of statistical and other data respecting the mining industries of every section of Canada and very full and authentic details of the organization and operations of the collieries, blast furnaces, metal mines and other mining enterprises. A new feature which will especially commend itself to buyers of ores and minerals will be found in the List of Producers, classified according to industries. Almost the entire issue having, as usual, been sold on subscription in advance of publication, only a few copies of the edition for 1901 are on sale. The work will commend itself to everyone desiring a handy and serviceable reference book to Canadian mining enterprise.

Mr. Henry S. Poole, M.A, A.R.S.M., who lately severed his long connection as manager of the Acadia Coal Co, has been for some time engaged in an examination of the coal measures of the Province of New Brunswick, and will advise the Government as to the most desirable points for carrying on boring operations. We are indebted to Mr. Poole for the unique photo reproduced in this issue of an actual working coal mine at Grand Lake. The motive power, a horse, inside in the building, is not shown.

The feature of our next REVIEW will be an excellent sketch of the "History of Mining in Newfoundland" from the pen of Mr. J. P. Howley, F.G.S, Government Geologist Mr. Howley's paper will be generously illustrated with a series of handsome photos of the coal, iron, copper and other mines for which the Island is famous.

The London & B C. Goldfields, Limited.—one of the few English syndicates operating in Canada, whose affairs have been distinguished by shrewd business administration—held its annual meeting in London on 17th instant. An excerpt from the Directors report, reviewing the work done during the year by the Ymir, Whitewater, Enterprise, Ruth, and other subsidiary ventures of which it is the parent corporation, is given in another portion of this REVIEW. As it was found impossible owing to the dullness of the market to realize upon the Company's share assets in these companies, except at a sacrifice, the cash profit on

shares sold amounted to only £9,517 18s. 9d. which, after meeting general administration and other expenditures, gave a net balance of £3,012 19s. 10d. The policy adopted by the Ymir Company in putting its large profit into the mine instead of distributing same as dividends also had an unfavorable effect upon the profit and loss account, as otherwise the company would have been entitled to some £12,000 from that source alone, which with the balance of £3,012 19s. 10d. would have been sufficient for a 10 per cent. cash dividend on the capital. It is proposed to pay one shilling per share as an interim dividend for the current year.

The Department of Mines, Halifax, is to be congratulated on the issue this month of a very handily arranged brochure dealing with the mineral resources of Nova Scotia. Dr. Gilpin's latest contribution to the mining literature of Nova Scotia will be appreciated by all who take an interest in the welfare and progress of the great mining enterprises down by the Sea.

Gold dredging on the Saskatchewan gives promise of becoming at no distant date an important acquisition to the successful mining industries of the country. Several dredges of an antiquated type have been at work for several seasons and notwithstanding their many disabilities have earned excellent returns to their owners. These have lately been supplemented by a number of dredges of modern design and equipment, and orders for others are under way. Mr. Isaac Cowie, a respected citizen of Edmonton and one of the old-timers on the river, gives, in a recent pamphlet, some interesting particulars of the work now going on. He says: "Near Big Island, about 13 miles up stream from Edmonton, are situated the claims of the "Star" and "Loveland" companies. The Star dredge operated successfully and profitably during two part seasons, until carried away by an unprecedented flood in 1899. It is said to be the intention of this company to resume work with a dredge of large capacity, as soon as the expected success of the large new dredges of the Saskatchewan and the Alberta companies may enable them to procure the further capital required to operate on an adequately large scale. Their old dredge had a 12 h. p. engine, was operated by three men and a boy, and won from $25 to $40 a day. The average amount saved out of one cubic yard of gravel, weighing 3,000 lbs., was 40 cents, and besides this much fine gold was known to escape their imperfect appliances. The Loveland dredge is of larger capacity, and is operated by two separate 20 h. p engines. It has been in use during 1899, 1900 and the present season. Their ground appears to be rich enough to be profitably worked by a dipper dredge, and their chief trouble was with the gold saving apparatus. This, which caused much loss of time, was arranged to their satisfaction in 1900. Before that, in 1899, they sold locally $4,000 worth of gold, and probably exported some to the United States. After allowing liberally for their running expenses, $2,000 of the $4,000 may be supposed to have gone to the shareholders one way or another. Great expectations were formed of the large "Otter" dredge of the Saskatchewan Gold and Platinum Proprietary, erected by Mr. A. E. Hogue, partially on the New Zealand model and partially on combinations of his own. It was completed too late in 1898 for a test to be made. In 1899 it was tried, and, while again demonstrating the richness of the river, proved unsuitable wherever departures had been made from the New Zealand system. This costly dredge was consequently condemned by Mr. George Macfarlane, another Australian mining man, who succeeded Mr. Hogue as manager in the fall of 1899. Mr. Macfarlane was, in the winter of 1899-1900, sent by the Proprietary to New Zealand to acquaint himself with the most recent dredging methods there. Upon his return to England he condemned the "Otter" and caused his company to order a sister dredge to that already ordered by the Alberta Gold Dredging Syndicate, Limited, of London, to be constructed by Messrs. Renshaw & Co., of Stoke-on-Trent, on plans from the New Zealand Government's blue book procured and sent by me to the Alberta company. During the season of 1900 the "Otter" was refitted with a new screen and gold saving tables by Mr. Macfarlane, but the new machinery arriving late, the old machinery frequently breaking down and unseasonably bad weather setting in prevented much more being done than to again prove that "the gold is there." A Wilfley concentrator was procured by Mr. Macfarlane and proved, even on the unsteady deck of the "Otter," most serviceable in concentrating the sand from the gold saving tables. The two new dredges are supplied with Robey's condensing engines, giving them 100 h. p. each. Their estimated capacity is 3,000 cubic yards each in 24 hours, with machinery so nearly automatic that three men per shift are expected to handle them. The dredge of the Saskatchewan Proprietary is named the "Minto;" that of the Alberta Syndicate the "Alberta," and they are now (May, 1901) expected to be soon at work. The manager of both concerns at Edmonton is at present Mr. F. P. Hobson, who has had two season's dredge mining experience on the "Otter." The success of those dredges is anxiously hoped for by everyone interested in Saskatchewan gold mining."

We are glad to note indications that Old Country manufacturers are becoming alive to the value of Canada as an important and rapidly expanding market for mining supplies. For many years the great bulk of the purchasing done by our collieries, mines, mills and smelters, aggregating several millions of dollars yearly, has gone to our skilful and enterprising neighbors, some of whom, found the trade so successful that they have established large works in various parts of the Dominion for the manufacture of special lines of mining machinery. There is, however, no good reason why British manufacturers, who turn out many commodities eminently suited to this market, should not command a very much larger share of our trade. It is true that they are handicapped to some extent by distance, but this we should think would be greatly minimised by their cheaper labour and the lower price they have to pay for material. Canada, with her matchless water power and a market which is rapidly increasing and must expand for many years to come, offers great opportunities for the establishment of branch works to meet the growing requirements of our mineral producers. Already such houses as Walker Bros., of Wigan; Fried Krupp, Germany; Firth & Son, of Sheffield; Brown & Co., Liverpool; Bennett & Son, Cornwall; John Davis & Son, of Derby, and other British manufacturers, have now well established connections on this side. Among the more recent acquisitions we are glad to note that of Hollman Bros., the well known Cornish rock drill makers, who have given an agency to Mr. Roland Machim, of Victoria, while the great and only Hadfield's whose castings, for gold mills, collieries and mines are known the world over, have secured the services of our pushing young friend, Mr. Francis T. Peacock, of Montreal. Mining men benefit from competition. We have lots of room and opportunity for many others from the old sod.

The Province of Ontario is to be congratulated upon the very fine display made of her minerals at the Pan-American. Our correspondent gives in another place his impression of the various collections in this connection, and we are particularly indebted to Mr. Frank. N. Speller, B.A.Sc., superintendent of the exhibit for the fine series of views which accompany this article. In a letter to the REVIEW Mr. Speller says:— "Owing to lack of space and the massive characters and number of our minerals represented, it was found necessary to divide the exhibit, using space on the front verandah and north porch in addition to our 1,200 square ft. allotment inside. The Corundum, Graphite, Nickel-Copper and Concentrating Copper Ores are well shown. The samples run from

six tons down and aggregate about 90 tons of material. Mr. Edison has paid us three visits during the past few days, and was particularly struck with the quality and abundance of our nickel ores and graphite. They are, as you know, the essential parts of his new successful storage battery. So interested did he become that he has started on a tour of the nickel mines with one of his engineers. I mention this as being one of the latest and more direct evidences of the good such a display is likely to do the country. It is certainly hardly possible to estimate the influence and importance of Edison's new system of storage battery, but we have the necessary elements, and it should stimulate those interested in graphite deposits to develop their properties and show what they have. In this respect the owners of the Black Donald Mine, through their enterprise on this occasion, have done much for themselves and for the province at large." In other respects the mineral exhibits from Canada are disappointing, doubtless due to the counter attractions at Glasgow, where the Geological Survey made its principal display.

Just as we go to press we learn of the purchase by a Montreal Syndicate of valuable iron mining lands near Kitchener, East Kootenay, which means much for the future welfare of British Columbia. The purchase consideration was $80,000 in cash. The property comprises fifteen claims, the vendors being Chas. P. Hill, James D. Sword, F. W Peters, E. J. Matthews, J. Roderick Robertson and S. M. Brydges. The claims contain a very large body of rich hematite iron ore, varying from 50 to 200 feet wide, and it is the intention of the syndicate, as far as can be learned, to commence the manufacture of steel as soon as the necessary work can be done. That the company had this in view in purchasing the property is apparent from the fact that the ore is much too rich and valuable to be used entirely for fluxing in smelters.

The syndicate is composed of some of Montreal's wealthiest citizens and with such an aggregation undertaking a large industrial enterprise in East Kootenay the future of that district is assured. The iron and steel works will not be erected on a small scale but will involve an expenditure $1,000,000. Excellent water power can be secured at Kitchener from Goat River. The company thorougly prospected the ground with diamond drills, having Mr. W. H. Blakemore, formerly of the Dominion Coal Company, in charge of the mining operations. Mr. Blakemore has represented the purchasers in the transaction throughout and put the deal through here. The diamond drilling showed such satisfactory results that the syndicate paid the remaining $63,000 cash.

So far as the market is concerned for the steel and iron which the syndicate purposes manufacturing it is a very large one and consists of the entire Pacific slope, practically from Cape Horn to Behring Sea, therefore, there will be ready sale for the products of the furnaces at good prices. There are only a couple of furnaces, and they do not cut much figure so far as their output is concerned, on the Pacific coast. There is a small furnace at Port Townsend, which is owned by the Union Iron Works of San Francisco. This is occasionally kept in operation in the making of a pig iron and the product is of poor quality. The other furnace is located at Oswego, near Portland, Ore., and it makes a small quantity of iron, using charcoal instead of coke for smelting. The output of the furnace is utilized in the making of cast iron water pipes. One reason why the deposits of iron along the coast have not been utilized is because there is no coke produced there of suitable qualiay for the purpose. The coke has not sufficient structural strength to hold up the iron ore long enough for it to smelt. The coke made from the Crow's Nest coal is splendidly suited for iron smelting as it has more than ordinary structural strength. The advantage which the Kootenay iron and steel will have over that produced near the Atlantic seaboard will be the haul across the continent or the carriage by vessel around Cape Horn. This will give the products a decided advantage as it will be almost equal to a monopoly of the market. Under the circumstances it looks as though the project would be among the most successful that ever was undertaken it the Province.

Our congratulations to friend Blakemore on his success in this notable enterprise.

The high prices ruling for Canadian asbestos and the remarkable activity in the production of this valuable mineral from our old established mines in Eastern Quebec—the world's chief source of supply—has excited interest in other localities where indications of the mineral are known to occur. The latest fairy tale comes from the State of Vermont where deposits of a harsh, gritty, short fibred character are said to be under development. The fine spinning qualities of Canadian asbestos are so superior to any known product that competition from this source need not be seriously entertained. Like the Black Hills mica boom it is largely in the air.

In a lecture on mechanical rock-drilling, delivered by M. Henri Ghysen, Ingenieur des Mines, Belgium, he described two important drivings, one by means of hydraulic rock-drills, and the other by electric drills, arriving at the following conclusions:—The electric rock drill is far more suited to the work of collieries than is the hydraulic drill, on account of its slight weight and easy management. It is set up with less difficulty, and if the advance obtained is not quite so great, this circumstance is largely set off by the diminished cost of working. The hydraulic rock-drill is, however, calculated to render good service in very hard rocks when great speed of execution is required, and under which circumstances the advance made with the electric drill becomes slight. On the whole, in the works required at collieries the electric must be regarded as more economical than the hydraulic rock-drill.

Our Mineral Exhibit at the Pan-American Exposition.

[Special Correspondence]

Canadians generally, but geologists and miners especially, will find in the Mines Building at Buffalo's great Pan-American Exhibition an exhibit which will make every Canadian heart beat fast to think of the wonderful resources in minerals contained in their land. No other exhibit shown there can compare with it in beauty, variety or completeness. The Ontario exhibit is particularly noteworthy.

The Ontario exhibit is in charge of Mr. F. N. Speller, of Toronto, who takes the utmost pains to describe Ontario's mines to questioners. He also had, under the direction of Mr. T. W. Gibson, of the Ontario Bureau of Mines, much of the work of collecting samples and specimens, and he had an efficient assistant in Mr. J Walter Wells, of the Ontario Assay Office, at Belleville, who contributed no small amount of time and labour toward the exhibit from Eastern Ontario. The whole exhibit is complete in every way, and maps of all the mineral lands are attractively shown and most clearly marked, so that the gaining of information is a very easy matter.

The exhibit is prominently situated and is enclosed by tall, very handsomely finished pillars surmounted by banners and the good old Union Jack. The original floor space promised was about 1,250 square feet, but as this could not be granted, the space is somewhat cramped, and as a result an "overflow" show of some of the larger specimens has had to be made on the floors of the porches. The exhibit is in itself a tangible illustration of the wonderful amount of economic minerals that is to be found in this one province. One of the most striking exhibits, which never fails to attract attention, is the gypsum statue of Miss Canada supported on three very large blocks

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War Eagle and Centre Star,
Rossland, B.C.

BERNARD MacDONALD, M.E.,
LeRoi Mine,
Rossland.

S. S. FOWLER, E.M.,
London and B.C. Goldfields,
Nelson.

JOHN B. HOBSON, M.E.,
Con. Cariboo Hydraulic,
Bullion, B.C.

FREDERICK KEFFER, E.M.,
B.C. Copper Co.,
Anaconda, B C.

A. B. W. HODGES,
Granby Smelter,
Phœnix, B.C.

ROBERT HEDLEY, E.M.,
Metallurgist,
Hall Mining and Smelting, Nelson.

PAUL JOHNSON, E.M.,
Metallurgist,
B.C. Copper Co., Greenwood, B.C.

FRANK ROBBINS, M.E.,
North Star Mine,
Kimberley, B.C.

ERNEST WOAKES, A.R.S.M.,
Duncan Mines, Nelson.

M. S. DAVYS, C. & M.E.,
Nelson, B.C.

J. ROD. ROBERTSON,
London and B.C. Goldfields, Nelson.

J. M. HARRIS,
Reco Mine, Sandon, B.C.

LESLIE HILL, C. & M.E.,
Vancouver, B.C.

E. J. FIELD,
Sandon, B.C.

HOWARD WEST, A.R.S.M.,
New Denver, B.C.

JAS. R. GIFFORD,
Superintendent, Silver King Mine, Nelson.

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Greenwood, B.C.

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Brookfield Mining Co.,
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Inspector of Mines,
Halifax.

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Sydney Mines,
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GEORGE W. STUART, M.E ,
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CLARENCE DIMOCK,
Wentworth Gypsum Co.,
Windsor, N.S.

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Gowrie and Block House Colliery,
Port Morien, C.B.

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Wabana Iron Mine,
Newfoundland.

GRAHAM FRASER,
Nova Scotia Steel and Coal Co.,
New Glasgow, N.S.

W. L. GRAMMER, M.E.,
Bell Island Iron Mines,
Newfoundland.

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Goldenville, N.S.

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JOHN BLUE, C. & M.E.,
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Eustis, Que.

HARVEY GRAHAM,
Nova Scotia Steel and Coal Co.,
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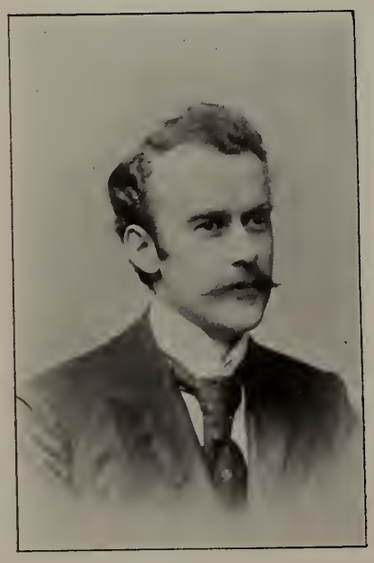

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W. F. LITTLE,
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Anthracite.

ELLIOT T. GALT,
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Lethbridge, N.W.T.

J. R. COWANS,
Cumberland Ry. and Coal,
Springhill, N.S.

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Intercolonial Coal,
Westville, N.S.

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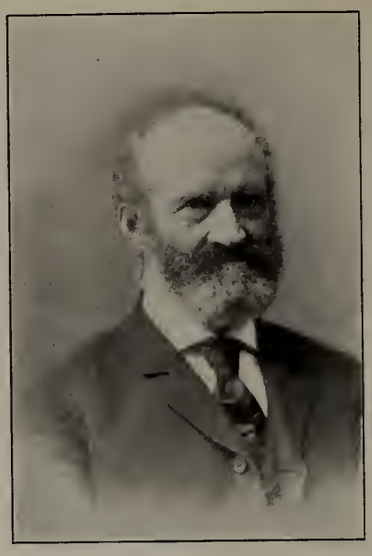

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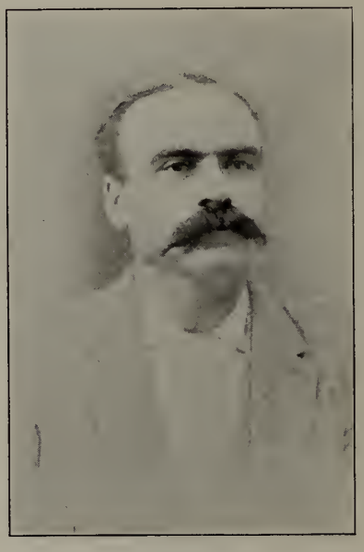

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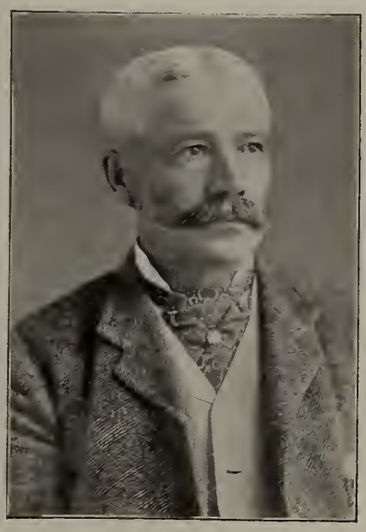

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Nelson, B.C.

F. H. MASON, F.C.S.,
Halifax.

JAMES D. SWORD, M.E.,
Nelson, B.C.

H. HARRIS, A.R.S.M., F.G.S.,
Vancouver, B.C.

J. F. BLEDSOE, M.E.,
Alberni.

THEO. BRIEDENBACH,
Mine Manager, Rat Portage, Ont.

of graphite, under which is a handsome limestone pedestal from the Queenston Quarry. The graphite is from the Black Donald Mine, Brougham Township, Lanark Co. One lump of two tons weight is the largest mass of graphite ever mined. Hundreds ask daily about this important material which enters into numerous commercial uses, such as graphite paints, black lead, lubricants, etc. Your correspondent overheard one gentleman say: "And they look for gold, with millions in graphite. I cannot understand it."

EASTERN ONTARIO'S SHOWING

The exhibits from the working mines in Eastern Ontario show considerable activity in that district. The Canadian Goldfields, Limited, operating in North Hastings, have a very handsome and instructive exhibit, showing the various stages of the manufacture of white arsenic from the ore as it comes from the shaft, to the finished article, ready for the market, carrying 99.8 per cent. $AS^2 O^3$ equal to the best German and English grades of white arsenic. They also show the extraction of gold by amalgamation, and bromo-cyanide leaching in the same way, and have several bricks and cones representing the gold in its complete and pure condition. The specimens of mispickel ores, some showing free gold, are especially attractive.

The following exhibits from the district are worthy of note: Specimens of free milling gold ores from the Landenberger property in Hastings county; quartz with auriferous pyrites from the Belmont mine, now having a 30-stamp mill and cyanide plant working in Peterborough county; arsenic and mispickel gold ore from the Atlas Mine in Hastings county; also a similar exhibit from the Ohio Gold and Arsenic Mining Co.'s property in Marmora township. Some very fine specimens of free milling gold quartz from the Craig mine and the Sophia mine are objects of great interest. From the James mispickel property in Madoc township, Hastings county, there are several fine samples of arsenical pyrites, and the James Actinolite and Asbestos Manufacturing Co., at Actinolite, Hastings county, show very fine samples of their roofing materials. The sale of this fire-proof roofing material is almost entirely confined to the United States. The Toronto Mining Co. have a beautiful show of mispickel gold ores from the Campbell-Bloomfield property in Marmora township, Hastings county, and the Ledyard mine in Belmont township, Peterborough county, is represented by a splendid showing of rich looking gold-bearing quartz with pyrites.

In iron ores there is a very fine showing from this particular district. Among the magnetic ores, the most prominent are from the Sewmillee mine in Tudor, the Cook mine in Madoc, the Malone mine in Marmora, the Belmont mine in Belmont, the Coe-Hill mines in Wollaston, the St. Charles mine in Tudor, the New Find mine in Eldorado, and its neighbour the Sprague mine; the Child's mine in Mayo, and the Blairton mine in Belmont. All of these shipping mines are adjacent to the Central Ontario Railway.

The show of hematite ores is mostly from the Wallbridge, St. Charles, Welch, Empey and Eldorado mines of Madoc, and the Miller mine of Huntingdon. All of these mentioned mines are rich in ore, and nearly all are now being more or less actively worked. The greater part of the ore is shipped to Hamilton or Midland iron smelters.

From Frontenac county comes a fine exhibit of felspar, a valuable flux used in making china ware; and from Peterborough, Renfrew and Hastings counties are the exhibits of the very valuable mineral, corundum, which is being handled and shown in every state from raw rock to manufactured goods, such as corundum wheels, by the Canadian Corundum Company of Combermere. The value of this exhibit to Canada is very great, as it shows that the Canadian corundum is likely to control the market for abrasives, owing to an abundance of cheap raw material combined with the superior quality of the corundum as prepared for commercial use.

Building stones, such as limestones, marbles, etc., are represented by rough and dressed stones from the quarries in Hastings county, such as the Crookston quarry.

The Harrison talc mine near Madoc village shows samples of talc in the rough and ground ready for use as a paper-filler.

The mica mines in Frontenac county, supplying mica for electrical purposes, have excellent exhibits of rough and thumb-dressed mica. The Mica Boiler Covering Company of Toronto show, by samples, how scrap mica from the mines is utilized as boiler and pipe coverings, an excellent non-conductor of heat.

That Eastern Ontario is not deficient in precious stones is shown in a case of very handsome rocks containing sapphires, garnets and sodalite, and some of these have been pronounced by experts to be exceptionally fine stones, although in the rough.

Molybdenite, which is assuming commercial importance in the manufacture of ferro-molybdenum, used in the hardening of steel, is shown, but not in very large quantities.

In the eastern portions of Ontario are found beds of marl, of value in making cements, which are represented by raw material and cement from the extensive plant of the Canada Portland Cement Co., of Marlbank, also by marl from White Lake, Hastings county, analysing 94 per cent. calcium carbonate. These beds of high grade marl will shortly be utilized, as the demand for cement is constantly increasing.

Iron pyrites is in evidence, a fine sample shown coming from the Burnsides mine, near Bannockburn, Hastings county, being worked by the Nichols Chemical Co. of Capelton, Quebec.

SUDBURY DISTRICT.

The important mining and metallurgical nickel-copper industry of the Sudbury district is represented by samples from every working mine, ranging from 500-pound samples to one mass of pyrrhotite from Copper Cliff Mine, weighing five tons.

Every process and stage for the extraction of the nickel and copper is illustrated by samples.

The Nickel-Copper Co. of Hamilton, Ontario, show the Frasch electrolytic process for the extraction of nickel, copper, etc., from the matte.

The Bruce Mines and Rock Lake Mines show copper ores from these extensive deposits, being worked by modern methods. Exhibits of pig iron and ferro-nickel, as made from nickeliferous pyrrhotite by the metallurgists of the Clergue Syndicate of Sault Ste. Marie, are of special interest to steel experts.

MICHIPICOTEN DISTRICT.

The Lake Superior Power Co., of Sault Ste. Marie, have exhibits of iron ores from the Helen, Josephine and other important ore bodies in the Michipicotin district, showing the wealth of this district in hematite iron ores, which are now entering the American and Canadian markets.

RAINY RIVER DISTRICT.

The mineral resources of Western Ontario are represented by auriferous quartz from the working gold mines, such as Mikado, Regina, Sultana, Sakoose, also from several developed properties.

Most of these ores are low grade, but yet profitable under capable mill management, as they are all free-milling.

Iron ore from the Atikokan and Mattawin iron ranges being tapped by railway connection from Port Arthur, show that this district has abundance of high grade iron ore which, according to expert

ONTARIO'S MINING DISPLAY AT THE PAN-AMERICAN.

Exhibit of Auriferous Mispickel from the Mines of Hastings Co., Ontario.

Superintendent's Office—Ontario Mines Exhibit.

Exhibit of Structural Materials by Ontario Bureau of Mines.

Exhibit of Gold Quartz—Arch built of Milton Pressed Brick in background.

ONTARIO'S EXHIBIT OF MINERALS AT THE PAN-AMERICAN EXHIBITION.

The central figure "Miss Canada" shows the huge block of Graphite from the Black Donald Mine upon which the figure rests.

geologists, is exactly of the same formation as the Minnesota iron ore lying to the south-west, so that Ontario is probably to be an important iron ore producer.

As a whole, the Ontario exhibit is a tangible proof of the natural wealth in mineral resources of that extensive province, and is a credit to the Bureau of Mines.

That Ontario has a promising future in its mining industries, especially in regard to iron, copper, nickel and gold, can be seen from the recent reports issued by the Government as well as from the statistics of the production for the year 1900, as compared with previous years.

COAL MINING AND TRADE.

The condition of the coal trade in Nova Scotia has already occasioned considerable anxiety among the mine owners, and is rapidly assuming the phase which was indicated in these columns several months ago. Prices have already fallen from $4.00 and even $5.00 down to $2.50, and with the exception of the Dominion Coal Company none of the concerns are able to work full time. On the trading of the first six months of the year, all the companies, except the Dominion Coal Company and the Nova Steel and Coal Company show a considerable decrease aggregating nearly 100,000 tons, and with two new competitors in the market, in the Port Hood Coal Company and the Broad Cove Coal Company there will be considerable hustling during the rest of the season to make anything like a decent showing. In face of this the Nova Scotia Steel & Coal Co. are losing no time in putting down their new plant near Cranberry Head, and in their recently issued prospectus they estimate an output of 600,000 tons per annum, which is nearly three times the tonnage of the old company. As their coal is admittedly the best produced in Nova Scotia there is little doubt that they will always get their share of the trade, and if the directors of the Dominion Coal Company are able to cancel their unfortunate contract with the Everett Gas Company it will throw from 500,000 to 800,000 tons of coal upon the open market. This means that next year an additional outlet will have to be found for at least a million tons; and as the whole market is glutted and the railway companies are carrying heavy stocks, it will depend entirely upon the export trade whether this tonnage can be placed or not. We have repeatedly urged in these columns the absolute necessity for seeking a foreign market if the prosperity of the Nova Scotia coal trade is to be maintained. There is reason to believe that in this, as in several other important matters the Nova Scotia Steel & Coal Company will be the pioneers, as they have already opened up negotiations with a London firm for the sale of their coal. We are more convinced than ever that the London market is capable of taking at least two miilion tons per annum of our coal, and that it is possible to lay the latter down in the Thames at a lower price than the average cost of a similar English or Welsh coal estimated over a term of years. It looked, a few months ago, as if English capital would ensure this by taking up coal areas and developing them for the English market; but, owing to the cupidity of those who held available areas no actual sales have been made, a fact which we cannot regret, because the true interests of mining in this country are ill served by the exaction of exorbitant prices. Now that a lull has fallen upon the coal trade and prices are being reduced all the world over Canadians will begin to realise that in this respect they have missed their chance, and that the only probable chance of exporting coal to England rests upon the investment of Canadian capital. In this connection we regret to have to report the absolute failure of the exploratory work carried on by Senator McKeen and his colleagues upon the McVey areas; after three months' work and the expenditure of a considerable sum in boring operations the millstone grit has been reached without the discovery of any workable seam of coal, the only one passed through being four feet thick, and of doubtful quality. This is a great disappointment, not only to those immediately concerned but to the country at large, because it has been confidently maintained for many years that available coal measures underlay these areas, a view fully shared by the highest authority in the Geological Department, Mr. Hugh Fletcher. We are not yet satisfied that the question is settled, being of opinion that the bore holes were not put down in the most favourable position. Instead of boring near Grand Lake, we would have preferred seeing operations conducted in the immediate vicinity of Cochrane's Lake, where the late Mr. E. L. Moseley did considerable work, and in the judgment of good authorities bored within fifty or a hundred feet of the Mullens seam. However, it would be superfluous to suggest that anyone is better acquainted with the coal fields of Cape Breton than Senator McKeen and his associates; and if they say that the question is finally disposed of, it will be hard to induce anyone else to take up the proposition.

Considerable activity is being displayed in the district in which new discoveries of coal have been made in Alberta, and although it is too early to assess the exact value of this coal field, or to admit with those who are sanguine on the subject that it rivals in importance the areas of the Crow's Nest Pass, it must be admitted that the discoveries already made are of sufficient value and extent to justify the opinion that these coal fields will some day become an important factor in the west. All the way from Livingstone to Crow's Nest Lake and the Summit, a distance of nearly twenty miles, good workable seams of bituminous coal have been located. The quality is in some instances first class and only slightly inferior to the best coals at Fernie. One of the most favourable analyses is taken from a 14-foot seam on the property belonging to Messrs. McVittie and Leitch, which gives:

Moisture	1.0
Fixed carbon	63.4
Volatile combustible matter	29.1
Ash	7 4
Sulphur	.36
Coke	70.8

Upon this property there are fifteen workable seams of coal, aggregating 120 feet in thickness. Messrs. Fishburn and Procter have also taken up a vuluable property in the immediate vicinity of Blairmore Station, and six miles nearer to the mountains the Galt Company hold a number of sections. In addition to this at least half a dozen other companies are doing exploratory work; but the greatest progress has been made by Messrs. Frank and Gebo, who have taken up four square miles on the east side of Turtle mountain and have already opened up a mine and established a town. They have a vertical seam of coal fourteen feet thick, which has been proved for a distance of four miles upon the surface, aud they have already done sufficient development work to yield an output of 200 to 300 tons a day. The analysis of their coal is as follows:

Moisture	1.0
Fixed carbon	60.3
Volatile combustible matter	31.3
Ash	7.4

The coal has been subjected to severe tests for steaming and has yielded satisfactory results. It is doubtful whether it is a first class

coking coal, but this point will shortly be solved, as coking ovens are to be erected for experimental purposes. In any case, the energy and enterprise shown by these gentlemen is worthy of all praise; and if they are able to secure a portion of the steam and domestic trade of the west they will probably make a good showing. In this connection we wish to warn investors against rushing in and creating a boom, for which there is no justification, when it is remembered that in any event these coals are not equal to those in the past and therefore, that the market is extremely limited, and already well covered by the mines in operation. The advent of Mr. J. J. Hill and his associates, who have not only obtained a controlling interest in the Crow's Nest Pass Coal Company, but have also taken up twenty thousand acres of good steam coal on the east of the rockies, adjoining the south fork of Old Man's River, must mean a great reduction in the price of coal, and also that he will ultimately obtain all his supplies from the mines in which he is interested. The only other large purchaser is the C.P.R. and while their policy has not yet been defined investors would do well to bear in mind that they will, during the present fall be placed in possession of six square miles of coal areas in the Pass, as a part of their subsidy for the B.C. Southern and if they should decide to operate these for their own requirements the possible market for new ventures will, for many years to come, be extremely circumscribed. We understand that efforts are being made to introduce English capital, and that agents are at this moment actively engaged in this work in London. Whilst we welcome the introduction of English capital into Canadian ventures, and especially into the mining industry, we wish to point out that, in the present instance great care should be exercised and a very careful investigation into the possibilities of a market should be made before purchasing areas in this new coal field before embarking upon any considerable outlay. It is not a question of coal, or quality; both are undoubtedly satisfactory—it is entirely a question of market.

Mr. F. B Smith, for some years with the Crow's Nest Pass Coal Company has been appointed Inspector of Mines to the Government of the North-West Territories, in place of Mr. Evans, resigned. Mr. Smith will enter upon his duties on the 1st September and will take up his residence at Calgary. He is well acquainted with the district, having had ten years experience in the coal mines of British Columbia, and we congratulate him upon the appointment, and the Territories on having secured a practical mining engineer for the position of inspector.

We understand that the company, which has been operating under the title of the British American Coal Company, Alberta, consisting of Toronto capitalists in the disputed areas near Crow's Nest Summit, succeeded a few months ago, in bonding their property to a well known Canadian corporation. We have no idea what the consideration was, but understand that a considerable amount of cash changed hands in anticipation of its proving a second Crow's Nest Pass coal field. No one having practical knowledoe of the district shared these anticipations, and those who were acquainted with the country have always regarded the enterprise as chimerical. The work of the last three months fully confirm this latter view, and the people who put up the money have had the satisfaction of proving that the property in question conststs mainly of limestone mountains, and detached fragments of coal. There is no doubt sufficient coal to supply the consumption of the immediate neighbourhood, which would probably not exceed a thousand tons a year, but for any serious coal mine the property is entirely out of the question. It is a case of paying first and then being wise after the event.

Granby Smelter.

Considerable interest is aroused in British Columbia by the announcement that the Granby Smelter people contemplate an increase in their capitalization, raising it from fifteen million to twenty million dollars, and these who are best able to judge consider the proposal a farcical one in view of the past history of the company. In a thoughtful and very able article which appears in the British Columbia Mining Record of last month argued that among the many causes which had contributed to the present depression in the Province, possibly the most important was over capitalization, a contention which is emphasized by the enormous increase in values shown by present market quotations on British Columbia Mining Stock, compared with those of a year ago. It has been the custom in the east to attribute this loss chiefly to the failure of mining propositions to realize the expectation formed as to their productiveness, but the writer of the article referred to shows very clearly that the number of failures under this head is small, and that mining ventures have been wrecked chiefiy by the cupidity of eastern promoters. Of course this Province, like every other has had its share of wild cat schemes and the usual proportion of valueless mineral prospects, but in the main, whenever mining has been conducted under capable management and with due regard to economy, success has been attained. There are to-day in the Province a number of mines working under the latter conditions which would be a credit to any of the oldest camps in the United States, which are furnishing steady employment to a large body of workmen and paying regular dividends to the fortunate shareholders. The dissapointing mines are those which, instead of being worked upon legitimate lines as a parmanent investment, and for the purpose of yielding moderate but continuous dividends have been simply manipulated for gambling purposes by speculators or promoters, who cared nothing for the ultimate result, and stood only to enrich themselves at the earliest possible moment at the expense of the investing public who were ignorant of their policy. One of the commonest methods of attaining this end has been by over-capitalization, which has placed at the disposal of promoters an inordinate number of shares and thus enabled them to take advantage to an undue extent of any increase in value, which by skilful scheming they were able to create on the stock market. Without suggesting that this is the case with the people who are responsible for the management of the Granby properties it is and undoubted fact that the present capitalization of fifteen million dollars is enormously in excess of the value of the property, and to raise it still further will only tend to accentuate an evil which has already been productive of great loss to the Province. It is a well known fact that the total expenditure in cash both for purchase and development of all the properties in the Granby smelter group, including the smelter itself does not exceed one million dollars, and when in the early months of this year the representatives of this company, Mr. J. P. Graves and Mr. A. L. White were in New York negotiating for the sale of the property, or at any rate exchanging pour parlers with the Amalgamated Copper Company having that object in view, the latter could not be induced to give as much as two million dollars for the property, and they are probably as good judges of its value as it would be possible to find. How, in face of these two facts a capitalization of twenty million dollars can be defended passes the comprehension of mining men in British Columbia, who feel that it is only inviting a catastrophe to take such a step. It is further urged that there certain circumstances connected with the Granby company which are not calculated to inspire confidence, and which in fairness to their own shareholders at any rate, if not to the investing public, should be explained. The first is, that no authorative statement has yet been given as to the average value per ton of ore treated, although the smelter has been in operation since last year. Repeated appli-

cations have been made to the company by shareholders for this information, but it has been refused for motives of policy. In view, however, of the present proposal it can hardly be withheld any longer, and if, as is currently believed by those in the best position to judge the average gross value of the ore treated does not exceed five dollars, it is doubtful if operations are not being carried on at a positive loss, in which case further increase in capitalization would be indefensible and the present quoted price of Granby stock far in excess of its actual value. British Columbia has already suffered sufficiently from misleading reports made by directors of leading mining companies to their shareholders, and it is hardly less culpable on the part of the directors of the Granby company to withhold important information, without which it is impossible to estimate the value of the stock which they are apparently bent on increasing and which in any case they are offering the public as an attractive investment.

Gold and Arsenic.

Fine Exhibit Made by the Canadian Gold Fields at Pan-American.

The Deloro Mine, situated in the Township of Marmora, Hastings County, Ontario, is unique among the mines of the world in that it is a producer of *both* gold and arsenic. Moreover no other mine in all America is a producer of arsenic.

Besides being unique among producing mines, the Deloro has other somewhat exceptional characteristics. These are in connection with the form and relations of its ore bodies.

The exhibit is intended to illustrate not only the products of the mine, but it also shows, by means of hand specimens, the character of the complicated ore bodies.

The mine is situated near the contact of two igneous masses of rock of Laurentian age. The older of these masses is quartz diorite. Immediately to the east of the diorite mass, there is a large area of granite with a width of several miles. The granite is seen to be younger than the diorite, as it sends dikes of various sizes through it in every direction.

Crystalline limestone or calc schist also of Archaean age occurs not far distant from the mine and has also been cut through by granite dikes. Silurian limestone forms outliers over the Archaean within one half mile to the west of the mine.

The openings or cavities now occupied by the ore bodies owe their origin in all probability to the contraction of the granite mass on cooling. The disturbed zone along which the granite dikes cut through the diorite was again fractured. This fracturing was apparently done very gradually, as there is little evidence of faulting. The openings are due to a simple pulling apart of the diorite by the cooling and contracting of the large mass of granite. The diorite being cool and also being cut through by granite dikes was apparently less able to withstand the more or less horizontal pull of the contracting granite mass than the warmer and tougher granite itself. Hence the ore bodies are found in the diorite zone.

The openings were no doubt further enlarged by the action of water on the diorite.

The following cuts represent specimens in the collection which are used in place of artificial models, to illustrate fractures actually observed in working the ore bodies. They show on a small scale most of the characteristics of the deposits.

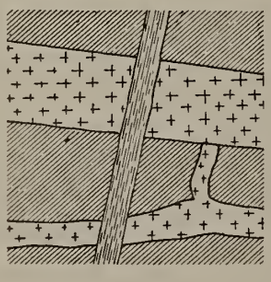


Fig. 1.

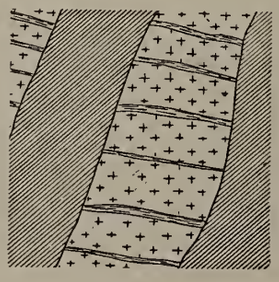


Fig. 2.

Specimen No. 1 shows that the veins of quartz, which are generally more or less lenticular in form, hold their course through both the granite and diorite, and are thus younger than either of these igneous rocks.

Specimen No. 2 shows that there was considerable contraction in the smaller granite dikes at least.

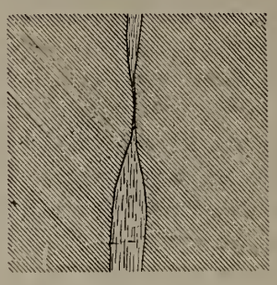


Fig. 3 (a).

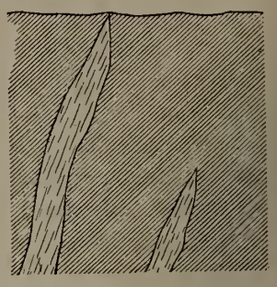


Fig. 3 (b).

Specimen No. 3 shows the lense shape form of the ore bodies. Some of the lenses outcrop at the surface, the exposures representing sections through the more central parts of the lenses. At other times, the extreme edge of a lense shows at the surface. Again lenses have been encountered in mining which do not outcrop at the surface. Specimen 3 (b) illustrates this last occurrence.

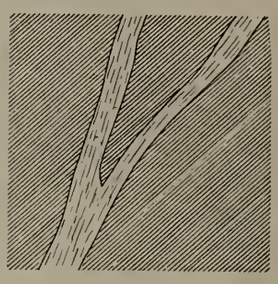


Fig. 4.

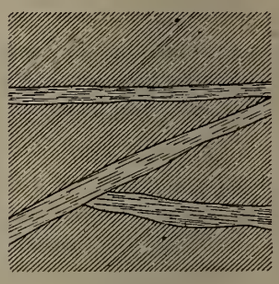


Fig. 5.

Two lenses with a slightly different strike and different dip come together. This is seen in the main working where the so called Gatling vein forms a junction first with the Tuttle and at a greater depth with the Dowd. Specimens 4 and 5 illustrate this phenomenon.

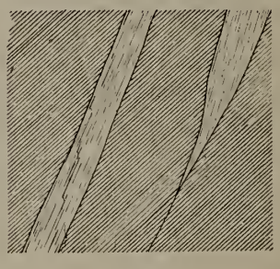


Fig. 6

Fig. 7.

Specimen No. 6 shows two parallel lenses, one of which reaches to a comparatively short distance below the surface.

Specimen No. 7 shows a wider out-crop becoming narrower as the lense is followed downward. It also shows irregularity in size. At other times the lenses increase in size with depth, and generally become more regular and better defined.

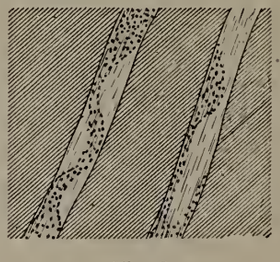


Fig. 8.

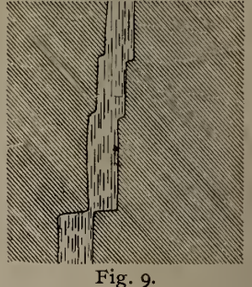


Fig. 9.

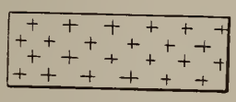
Specimen No. 8 shows two parallel veins with richer and leaner bunches of ore.

Specimen No. 9 shows how a foot wall may become the hanging wall

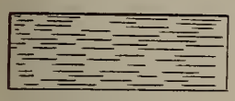
in going upward, due to the character of the original crack in the rock and not to faulting of the vein. This actually occurs in the winze connecting the third and fourth levels in the main working.

KEY TO ILLUSTRATIONS.

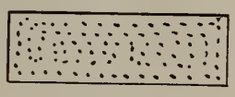
Diorite.



Granite.



Quartz Vein.



Gold Values.

Specimens Nos. 11 and 12, Diorite; Nos. 13 and 14, Syenite phase of Diorite; No. 15, Granite; Nos. 16 and 17, Granite dikes, cutting Diorite; No 18, Brecia, Diorite cut by granite and veined with quartz from south end of fourth level; Nos. 19 and 20, Schist from decomposition of Diorite along the walls of the veins or lenses; No. 21, interbanded altered Diorite with siderite which occurs along extremities of lenses; No. 22, calc schist; No. 23, Silurian limestone.

The material filling the ore bodies consists of quarts together with mispickel, iron pyrites, copper pyrites, hematite and various carbonates calcite, siderite, ankerite, horneblende and free gold. Pieces of the wall rock are frequently found mixed with the vein matter.

Specimens of the ore of various kinds from the different veins are shown in the collection.

The peculiar structure and occurrence of these ore deposits have been studied very closely during the past five years, by the writer, and the plan of working them has been in conformity with the conclusions arrived at.

Lately these conclusions have been fully confirmed by Prof. W. G. Miller, Government Geologist, after a close and careful examination of the mine workings and the surrounding country. The writer is also greatly indebted to this gentlemen for able assistance rendered in the collection of these specimens.

TREATMENT OF THE ORE.

Following up the samples, we here show the crushed ore "battery pulp," then samples of concentrates and of tailings, and again the concentrates after being roasted for their arsenic contents.

The method of treating these ores is briefly as follows:

The ore is crushed with gravity stamps, the major portion of the gold contents is saved by amalgamation inside the mortars and on the plates.

The pulp flows to the concentrators, "Frue Vanners and Wilfleys," the tailings being automatically sampled and allowed to run to the tail dumps.

The concentrates consist of mispickel mainly and carry about forty per cent. of the original gold in the ore.

The concentrates are treated for their gold contents by the Bromo-Cyanide Process, which, in combination with the amalgamation above mentioned, extracts eighty-five to ninety per cent. of the gold values in these ores and at minimum cost.

The process used for extracting the gold from these concentrates was first invented and patented by Messrs. Sulman and Teed, and known as the Sulman-Teed Broma-Cyanide Process. This company acquired the sole right to these patents for Ontario in 1896, and have since developed the process to meet the peculiarities of these refractory ores successfully.

ARSENIC.

The concentrates after leaching by Bromo-Cyanide liquor are transferred to the arsenic works where they are calcined. The residue from the latter operation is here represented by "roasted concentrates" These are cooled and allowed to accumulate outside, there to await possible further treatment for their iron contents.

The product from the calcination consists of crude arsenic of different degrees of purity (see samples) and this is collected in a series of condensing chambers.

The crude arsenic is in turn refined, producing white Arsenic (As_4O_6) The refined arsenic is also collected in condensing chambers, portions of it forming into crystals in various forms as shown, and the balance as a fine powder.

The crystals and fines are then ground together to a very fine powder, the product packed in kegs containing 400 to 450 pounds each and shipped to the consumer.

SUMMARY.

It will be readily understood that this mine has presented a great many peculiarities and difficulties from geological and metallurgical points of view respectively. Many attempts have been made to extract the gold values in these ores, and a vast amount of capital has been expended in fruitless efforts.

Monuments to this may be seen on photos Nos. 1, 2 and 3, showing that three mills have been built at different periods. The first two were total failures, the third only partially successful.

All of these attempts showed conclusively what should not be done, and served as a most valuable lesson, which the present management did not fail to profit by when designing the plant now running. This plant can be seen on photo No. 4.

Photos No. 5 and 6 are general views of the mine surface plant; No. 7 shows the Gatling or main shaft house; Nos. 8 and 9 the Air Compressor building and the engine within; No. 10 the workmen's quarters; No. 11 the staff's quarters and office; and No. 12 the Deloro Hall. This was built by the company for their employees to be used for church, school and library purposes, and for social gatherings.

Rossland in 1900.

By J. KIRKUP, Gold Commissioner.*

The ore shipments made were as follows:—

Le Roi	159,734 tons.
Le Roi No. 2	3,013 "
War Eagle	9,886 "
Centre Star	40,875 "
Iron Mask	2,739 "
Evening Star	345 "
Giant	504 "
I.X.L.	432 "
Spitzee	106 "
Total	217,636 "
Gross value	$2,333,125

DETAILED STATEMENT.

Le Roi Mine.

Tons of ore shipped (dry)	159,734
Gross value	$1,437,726
Average number of men employed	655.25
Underground	435.85
Surface	219.4
Development—	
Shafting	900 feet.
Driving	2,061 "
Raising	379 "
Cross-cutting	1,085 "
Additions to plant—	
Total value of plant and surface improvements	$378,207.90

Additions for this year consist of—
1 40-drill air compressor.
1 hoist engine, steam operating.
1 electric hoist engine.
9 boilers.
Crushing and sampling machinery.

Additions to compressor building—
New boiler house for 12 boilers, 38 feet by 140 feet.
3 new ore-bins, 1,000 tons holding capacity.
Aerial tramway; capacity, 100 tons per hour.
New head frame, 100 feet high.
Hoist engine room.
Crushing and sampling mill; 100 tons per hour.
Timber and timber framing shed and carpenter shop.
Blacksmith and machine shops and storehouse.

ROSSLAND GREAT WESTERN MINES, LIMITED.

Nickel Plate Mine.

Tons of ore shipped	*Nil.*
Average number of men employed	113
Underground	82
Surface employees	31
Development—	
Shafting — Raising third compartment alongside working shaft, making it a 3-compartment shaft	268 feet.
Sinking shaft, 3 compartments	218 "
Driving	1,900 "
Raising	59 "
Cross-cutting	1,131 "
Total value of plant and surface improvements	$61,319.66

*Mines Report, B.C., 1900.

A new hoist engine has been added to the plant, and the surface improvements have had the following additions made:—

New hoist engine building.
Head frame and ore bins.
New brick compressor building.

KOOTENAY MINING COMPANY, LIMITED.

Kootenay Mine.

Tons of ore shipped	*Nil.*
Average number of men employed	35
Underground	26.33
Surface	8.67
Development—	
Shafting	466 feet.
Driving	474 "
Tunnelling	68 "
Winzing	80 "
Raising	299 "
Cross-cutting	829 "
Total value of plant	$22,066.62

Additions consist of new compressor building and foundations.

LE ROI NO. 2, LIMITED.

Josie Mine.

Tons of ore shipped (dry), Josie and No. 1 combined	3,013.43
Gross value	$46,239.06
Average number of men	47
Underground	11
Surface	36
Development—	
Raising third compartment alongside working shaft	447 feet.
Sinking shaft	45 "
Sinking shaft on Annie	120 "
Driving	1,940 "
Raising	107 "
Winzing	141 "
Cross-cutting	917 "

Additions to plant consist of electric hoist engine.

Surface improvements consist of gravity tramway to railway and ore-bins in connection with No. 1 mine.

No 1 Mine.

Tons of ore shipped	See "Josie."
Average number of men	45
Underground	30.59
Surface employees	14.41
Development—	
Sinking	120 feet.
Driving	1,532 "
Raising	249 "
Winzing	86 "
Cross-cutting	251 "
Total value of surface improvements and plant for Josie and No. 1 mine	$53.778.05

Additions to plant consist of an electric hoist engine.
Surface improvements—
New head frame.
Hoist engine room.
Ore-bins and gravity tramway in conjunction with Josie mine.

War Eagle Mine.

Tons of ore shipped. year ending Dec. 31st, 1900	9,886
Gross value	$142,282.98
Average number of men employed	166
Development work	4,428 feet.
Value of machinery, buildings, etc. (increase during 1900)	$80,000

Centre Star Mine.

Tons of ore shipped	40,875
Gross value	$609,358.75
Average number of men employed	240
Development	3,525 feet.
Increase of value of machinery buildings during 1900	$190,000.00

Iron Mask Mine.

Tons of ore shipped	2,737
Gross value	$43,117.61
Average number of men employed	33
Development work	2,124 feet.

New St Elmo.

Tons of ore shipped	*Nil.*
Number of men employed	6 to 12
Development work	1,912 feet.

California.

Average number of men employed	25
Development—	
Drifting	825 feet.
Sinking	168 "
New machinery building, etc	$21,150.00

Sunset No. 2.

Average number of men employed	20
Development during 1900	450 feet.

Homestake.

Average number of men employed	15
Development—	
Shaft	210 feet.
Tunnel	1,200 "
Cross-cutting	900 "

Velvet.

Tons of ore shipped	*Nil.*
Average number of miners	12
" " surface men	20
Development work—Shafts, drifts and cross-cuts	1,000 feet.
Plant—2 7-inch Knowles pumps, and 1 1,500-foot saw-mill.	

Evening Star.

Number of men employed below surface	16
" " " above "	9
Tons shipped	348
Gross value	$4,985.50
Development—	
Sinking	250 feet.
Drifting	475 "
Cost of machinery	$1,800.00

Green Mountain.

Number of men employed	15
Development—	
Sinking	100 feet.
Cross-cutting	400 "

Machinery added—
20-horse power hoist.
5-drill compressor.
2 No. 7 sinking pumps.

I. X. L.

Number of men employed	11
Tons of ore shipped	432
Gross value	$39.800.00
Tunnels and raises	480 feet.

Spitzee.

Tons of ore shipped	106
Gross value	$2,635 00
Average number of men employed	6
Shaft	50 feet.

Douglas.

Average number of men employed	4
Tunnelling	480

Northern Belle.

Number of men employed	5
Development—	
Cross-cutting	315 feet.
Drifting	158 "
Sinking	30 "
Tunnelling	50 "

Giant.

Tons of ore shipped	504
Gross value	$6,986.00
Average number of men	9
Development work	300 feet.

Machinery consisting of—
An air compressor.
50-horse power electric motor.
Hoisting engine.
2 pumps.
3 machine drills.
50-ton ore-bin.

Cost of plant detailed	$10,000.00

Big Four Group.

This group consists of four Crown-granted claims, situated on Little Sheep Creek. The work done during the past year consists of 300 feet of tunnel and shaft, 5 men being employed.

Gertrude.

This property was worked for a short time during the early part of the year. No returns of amount of work done.

Bonanza Group.

Consisting of the Bonanza No. 3, Our Hope, Bonanza No. 3 Fraction, and Our Hope Fraction mineral claims. This is a very promising group, situate on Iron Creek, in the Norway Mountain camp. The property is being worked by the Rossland Bonanza Gold Mining and Milling Company, Limited, non-personal liability, and during the latter part of the year 75 feet of tunnel work have been done on the Bonanza No. 3.

Cascade Group.

This is also a very promising group of claims, comprising the Cascade, California, and Royal Kangaroo, and is situated on Grenville Mountain, to the south-west of Norway Mountain. During the past year 130 feet of tunnel work was done. The property is being operated by the Cascade Gold Mining and Milling Company, Limited, of Rossland.

MINING IN EASTERN ONTARIO.

By Prof. DeKalb, Inspector of Mines.

(Continued from July issue.)

COPPER—NICKEL MINES.

The activity in the copper-nickel district is greater than for many years past, resulting in extensive prospecting, and in the sale of many properties. The work so far done upon these deposits may be said to be quite superficial, however, and the future of deep mining here is quite uncertain. Diamond drill prospecting in depth has yielded mostly negative results, but this is inconclusive evidence of the non-existence of deeper-seated masses of ore. Considering the character and distribution of these deposits it would seem advisable to definitely settle this point by courageous exploration to lower levels than those yet reached.

THE CANADIAN COPPER COMPANY.

Copper Cliff mine : This mine, the deepest in the district, has been carried down to the thirteenth level, making a depth from the surface of 972 feet, the distance between the twelfth and thirteenth levels being 115 feet. The increase of depth during the year has been 85 feet. A drift has been run from the bottom of the shaft 80 feet southeast. The double track skipway has been extended to the full depth of the shaft.

On the twelfth level some back-stoping has been done in the second stope north 30 feet above the floor of the level. Ore is also being shot down from the third to the tenth level, the open stope extending down so far. The masses broken down are block-holed and mucked out on the tenth level. On the first level the drift was extended a few feet into the hill, and then abandoned.

The pumping system now in use in this mine is as follows : A small Northey pump lifts water from the thirteenth to the twelfth level ; here it is lifted by another Northey pump to the tenth level ; whence it is sent to the seventh level by a Cameron pump ; another Northey pump lifts it to the fifth level, and by a larger Northey pump it is delivered to the surface. A large Knowles pump was about to be installed to lift the water directly from the seventh level to the surface, thus dispensing with the fith level station.

A new underground dynamite magazine has been constructed in the old ninth level cross-cut. The door is kept locked, and the dynamite and exploders are stored in separate lockers in the magazine. About 100 lbs. of dynamite are stored at a time underground. The magazine is located 30 feet from the shaft, and is maintained in a cleanly condition, and comparatively dry.

An attempt was made to inspect the large stope with the aid of an acetylene lamp, but below the fifth level the atmosphere was too dense to see from wall to wall. The upper part of the stope, however, was clearly revealed and seemed to be secure. It is centrally supported by a rib, or inclined pillar, of irregular shape.

Evans mine : This mine has been stripped to the bottom, and is now closed, the pit being nearly filled with water. The engines, boilers, and other machinery have been withdrawn, and the pit and buildings left in a state of safety.

McArthur No. 1 mine : Work on the McArthur No. 1, and the southeast end extension, have been suspended and all plant and equipment removed. The pits have been fenced and the property left in safe condition.

McArthur No. 2 mine : The contemplated change in location of the shaft has been made. It now dips at a steeper angle, lying chiefly in the footwall back of the original position of the old shaft, It has been double-tracked for skip-haulage to the bottom, with a manway on one side. From the surface to the first level the distance is 130 feet, with an inclination of 42 degrees ; and from the first to the second level the distance is 65 feet with an incline of 72 degrees. Work on the first level is nearly finished, the ore having been stoped to the surface leaving an open pit, which extends down to the second level. On the latter, ore was being broken on the sides of the pit and stopes were being extended back toward the footwall. Sinking below the second level was in progress, a solid arch of ore having been left temporarily as a protection over the lower part of this working, hoisting being done through a small opening on one side by means of an auxiliary hoist set up on the first level station.

The changes in the surface plant at this mine consist of a new coal shed erected at the hoisting works, measuring on the foundations 360 feet by 20 feet. A new magazine for explosives has been erected 500 feet southwest of the blacksmith shop. It is built of logs and is kept in good condition. Scaling of the shaft wall above the manway was recommended and it was also advised to widen the manway near the top.

Clara Bell group : Only two of the openings in this group of mines are now being worked, called respectively the South Pit and the North Pit. The South Pit is 40 feet south of the rock house and is 40 feet deep, 60 feet long and 50 feet wide. Hoisting is done by derrick, with a steam hoisting engine. The North Pit begins 100 feet north of the rock house and is 45 feet deep, 60 feet long and 50 feet wide. A skipway extends north from the rock house to the bottom of this pit, receiving also the ore dumped from an upper working higher up the hill. This latter is an open quarry, 35 feet deep at the back, 60 feet wide and 40 feet long. A double track counter-balanced inclined tramway leads down to the lower pit, 180 feet in length. The equipment mentioned in my last report has been set up and is in operation. The dynamite magazine for these mines is located 600 feet west of the rock house, with a rise of ground between. It is built of wood, sealed with tongued and grooved narrow boards, and covered exteriorly with sheet iron, painted black. It is provided with double doors, but has no ventilator. A small preparation house for dynamite is located on the edge of a small pond about 500 feet north northeast of the rock house. This was not kept in as good condition as the other magazine. Greater cleanliness aud a safer approach were recommended.

The McDonald mine was no longer in operation.

Stobie mine : The only enlargement of this mine since the last inspection has been due to stoping, and this has consisted almost wholly in working back the benches by the underhand methods here employed. The mine has been surveyed and maps made, for the first time revealing the true size and shape of the stopes and their relative positions clearly. The stopes are not superposed so as to weaken each other, and the mine appears safer than would otherwise have been judged. Work is temporarily suspended in the second level stope, and it was recommended to bar access to it by a guard rail. It was further advised to open a larger vent between the third and fourth level stopes, so as to improve the ventilation below.

No. 3 mine : This is the same as that previously referred to as the Six and Six mine. Development has been carried on at the westerly deposit by means of a shaft 7 by 17 feet, and 40 feet deep, inclining 62 degrees to the west. The shaft is provided with a manway and a double skipway, the skips being run in balance, operated by a drum in the power house. The shaft extends into a pit 30 feet deep, 65 feet wide and 80 feet long, open to the surface. There is also a stope northwest from the pit, 30 feet wide, 20 feet high and 15 feet long. A raise is being driven from this stope to the surface, to facilitate underground work during the winter.

The rock house is of the ordinary type used by the Canadian Copper Company, and is located just east of the shaft mentioned. It is 36 feet high, with foundations 45 by 26 feet. On the ground floor is located the engine, driving the crusher, screens and picking tables on the second and third floors. A trestle for disposing of waste rock extends 96 feet east from the building. The power house is a frame structure 80 feet north of the rock house. It contains a boiler room, and a hoist and air compressor room. The three boilers and other appliances in this building are those formerly in use at the Evans mine. There is a blacksmith shop 200 feet south of the rock house.

The standard gauge railroad of the Canadian Copper Company to the Stobie mine has been extended from the latter point to the rock house of No. 3 mine.

CANADIAN COPPER COMPANY'S SMELTER.

The new construction at the old smelting plant consists of the following : A frame store-house for acids, 30 feet east of the assay office ; coal sheds, 45 by 25 feet alongside the railroad trestle north of the old coke sheds ; and a boiler house with a 50-foot iron stack, containing two 100 h. p. boilers, located about 40 feet west of the assay office. All five furnaces in the plant were in blast.

The new or west smelter has been finished according to the plans described in my last report. Three furnaces were in blast, and a fourth was being set up. Three Connersville blowers were in operation, and a fourth was being installed for the new blast furnace.

A small foundry has been built just north of the west smelter, with an ordinary cupola furnace and other accessory plant.

Some changes have been made during the year in the personnel at the mines. Mr. James McArthur remains general manager, but the following new appointments have been made : financial agent, Mr. A. P. Turner ; underground superintendent, Mr. John Lawson ; master mechanic, Mr. Louis H. Thullen.

The following general recommendations were made :—To employ compressed air for underground pumping, particularly in the deeper levels, and in shaft sinking; to use greater care in keeping magazines clean, to provide all powder men with fuse cutters and cap crimpers; and to adopt a regular system for distributing explosive supplies to miners, so as to avoid sending dynamite into the mines at irregular times and by parties other than those specially appointed for this duty, so far as practicable.

GREAT LAKES COPPER COMPANY.

The following development work has been done upon this property during the year: The shaft has been enlarged to a section of 8 by 10 feet, and has been carried vertically to a depth of 71 feet. At a depth of 45 feet an inclined shaft continues at an angle of 45 degrees to the north to a depth of 129 feet from the surface. This is still in process of sinking. One level has been driven at a distance of 75 feet from the surface measured along the vertical and inclined shafts. The east drift is 85 feet long. At a distance of 60 feet from the shaft is a cross-cut 26 feet toward the north. A single acting Knowles pump, with a discharge pipe of 1¼ inches diameter, is located near the shaft in this drift. The west drift is 70 feet long, and also has a cross-cut 28 feet long, starting 52 feet from the shaft and extending in a northerly direction. Hoisting is done by bucket on a skidway. The hoisting works are located 400 feet east of the shaft. The hoisting engine has a single drum, 21 by 22 inches, with steam cylinders 6½ by 9 inches, and winds a ⅜-inch steel cable. Power is taken from a 15-h.p. vertical boiler, which also supplies steam to the mine pump. The official signal code is used. The mine is ventilated by a 36-inch fan, located beside the mine mouth, and actuated by an independent engine.

The rock house is erected 300 feet southwest of the smelter, and contains a 15-h.p. engine and boiler and a Gates crusher. The smelter described in my last report is not in operation. A sleeping camp, 60 feet by 48 feet, well appointed in all particulars, has been erected 600 feet west of the smelter, and a boarding house has also been built 100 feet north of the sleeping camp. It was recommended that a larger cable for hoisting be installed without delay.

VICTORIA MINES.

This property, owned by Mr. Ludwig Mond, is located about 2 miles west of Whitefish, Algoma. The holdings are the following :—In the township of Denison, concession II, lot 8; concession III, lots 8 and south half of 9; concession IV, lot 8, and the north halves of 11 and 12; concession V, the south halves of lots 6, 8 and 9; in the township of Garson, Nipissing, concession II, the north half of the north half of lots 3, 4 and 5, and the northeast quarter of the north half of lot 6; concession III, the south half of lot 3, south half of lot 4, and the southwest quarter of the south half and the north half of the south half of lot 5. The approximate area is 3,000 acres. The staff consists of Mr. H. W. Hixon, general manager; Mr. W. H. Holland, cashier; Mr. A. B. Hixon, mine captain; and Mr. Jno. Grigg, master mechanic. The Victoria Mines are located about 2 miles north of the new station of the same name on the "Soo" branch of the C.P.R.

Numerous pits have been opened on the vein, which is similar to those occuring near Sudbury. Four of these have been deepened as shafts. The trend of the deposit as revealed by these workings is east and west. The main shaft is called No. 11. It contains two compartments and a manway, with a total cross-section inside timbers of 5½ by 17 feet, and is 92 feet deep. The first level has been run off at a depth of 50 feet from the surface. Shaft No. 11 A is sunk 167 feet east of No. 11. It has only a single compartment and connects with the 50-foot level from shaft No. 11. A pump station is located on this level on the north side of the shaft. Shaft No. 10 is 270 feet east of No. 11 A, and is 45 feet deep. At this depth there is a drift north 23 feet. The first, or 50 foot level connects shafts Nos. 11, 11 A and 12, and extends 53 feet east of No. 11 A. The work is all neatly executed and safe.

A shaft house is in process of construction, which will be 38 feet high from the shaft mouth to the sheave blocks. About 20 feet distant is the rock house, 32 by 27 feet on the foundations, and 30 feet high. A tramway from the shaft house enters above the third floor, on which stands a 9 by 15-inch Blake crusher. On the second floor are the screens and picking tables, and on the first floor are the loading bins for discharging into buckets on the aerial tramway line that will conduct the ore to the roast yards. The power house is situated 20 feet south of shaft No. 11. It is divided into an engine room, 30 by 30 feet, and a boiler room, 30 by 20 feet. In the engine room is a duplex 50 h. p. double drum hoisting engine, winding a ⅞-inch steel cable, a straight line 5-drill Rand air compressor, and a 20 h.p. horizontal engine for driving the machinery in the rock house. In the boiler room are three boilers, all of the locomotive type, one of 45-h.p. and two of 60-h.p. A blacksmith shop is located 150 feet east of the power house. The main dynamite magazine is 900 feet north of the shaft house, with a high hill between. It is built of logs and contains about six tons of dynamite. The explosives preparation house is 450 feet northeast of the shaft house, and contains about one box of dynamite at a time. Blasting is done entirely with the battery. The mine office is situated about 600 feet south of the shaft house, and near by are the assay office and lodging houses for the workmen. General offices, residences, warehouses, etc., are being erected at Victoria mine station.

An aerial tramway is being installed by the Trenton Iron Company of Trenton, N.J. This will be 11,000 feet in length, taking ore from the rock house to the roast beds near Victoria mine station. A smelter is also being erected on a siding from the C.P.R. at the station, and will contain two cupalo furnaces, two converters and accessory plant.

GERTRUDE MINE.

The development of the Gertrude mine has been continued as indicated as indicated below. Shaft No. 1, with a cross-section of 8 by 12 feet, has attained a depth of 120 feet. At a depth of 47 feet a drift has been extended 50 feet south. The second level has been established at a depth of 102 feet. The south drift has been run 70 feet, and the north drift 20 feet. The lower 18 feet of the shaft constitute a sump. No. 2 shaft lies 3,300 feet west of No. 1. It maintains a cross section of 8 by 12 feet to a depth of 80 feet. Both Nos. 1 and 2 shafts wrre closed at the time of my visit. No. 3 working is a drift mine, located 600 feet west of No. 2. It consists of a tunnel 65 feet long. This tunnel was not well drained, and connecting wire was used for leading wire for blasting. Recommendations were made touching both these matters. A 15 h.p. boiler was temporarily set np for supplying steam to the drill used in the tunnel. The exhaust was conducted by a pipe to the surface.

A temporary log power-house was located 150 feet northwest of shaft No. 2, containing a duplex single-drum hoist, and a 60 h.p. boiler of locomotive type. A new hoist and air compressor for permanent work were on the ground but not set up. A dynamite magazine has been erected 1,000 feet east of No. 1 shaft, in which were stored 3 tons of dynamite. Fuse and caps were kept in a storehouse near the boarding camp. The store and boarding house were located 600 feet southwest of No. 1 shaft.

The Manitoulin and North Shore Railway has been graded from Sudbury to a point near the Gertrude mine, a distance of about 12 miles. A spur is now being built to the mine, a mile and a quarter long. On the completion of the line from this point to Sudbury, which will be accomplished by the spring of 1901, active operations will be commenced at the Gertrude mine.

To be continued.

LONDON AND BRITISH COLUMBIA GOLDFIELDS.

The report of the directors of the London and British Columbia Goldfields, Limited, for 1900, presented to the meeting on the 17th inst., states that a very large number of properties and options were under examination and consideration during the year 1900, but as few were found to possess any sure indication of success without an undue amount of risk, none were acquired; the past year's work was therefore principally devoted to the further development and strengthening of the company's assets previously held. The option on the Lardeau property, referred to hereafter, was acquired since the date of these accouuts.

THE YMIR GOLD MINES.

One of the company's principal assets is still represented by shares in this company, the enhanced value of which is fully demonstrated by that company's improved position and the large profits now being made from month to month.

During 1900 extra stamps and other machinery have been installed, whereby the revenue earning capacity of the mine has been more than doubled. The cost of this machinery, etc., was entirely met out of the profits of that year.

Ore reserves have been blocked out for a depth of about 400 feet, and the vein sunk on for a further depth of 200 feet or more, where it was found to carry similar widths and values to that above.

A tunnel is also being driven for the purpose of working the mine at a depth of 1,000 feet below the surface, and is expected to be completed by the end of this year.

The present operating profits amount to about £5,000 per month.

Practical bulk experiments have also taken place proving the suitability of cyanide to the treatment of the tailings, from which a further monthly profit of nearly £1,500 is expected.

The London and British Columbia Goldfields Company's share-holding in this company is a considerable one, forming a valuable asset which the directors are anxious to, as far as possible, retain.

THE WHITEWATER MINES.

The London and British Columbia Goldfields Company's share interest in this mine remains practically the same as at the end of 1899.

The miners' strike did not terminate until February, 1900, and as some difficulty was then experienced in getting a suitable labour force together, it was not until somewhat later that the mine was able to resume shipments, which, however, were again suspended at the end of last year owing to the action of the American Smelter Combination in refusing to renew their contracts for dealing with the silver lead ores of the district.

This latter circumstance was unfortunate, occuring as it did just at the time when the mine had commenced to pay dividends which, from the appearance of the developments theu being carried out, gave every promise of continuance.

From these and more recent developments our engineers report the mine as looking far better than it has done for a long period previously.

Under these latter circumstances, and in view of the assistance recently granted to the local silver lead smelters by the Canadian Government, your directors look forward to an early settlement of the question and a resumption of shipments which it is believed would soon put the company again in a dividend-paying position.

THE ENTERPRISE (BRITISH COLUMBIA) MINES.

At this mine also the miners' strike prevented work from being carried out until about the end of February, 1900, when a sufficient labour force was procured and mining operations were commenced as soon as possible.

These operations soon revealed the fact that it was not practicable to handle and separate the ore by means of hand sorting without undue expense and considerable loss, and consequently steps were taken for the erection of a suitable concentrator for the mechanical treatuent of the ore, pending which only small shipments have been made and work principally confined to the further development of the mine.

These developments have been satisfactory in largely adding to the ore reserves previously opened up.

The shares held by the London and British Columbia Goldfields Company in this company remain practically the same as when last reported.

THE RUTH MINES.

It will be remembered that the principal vein on this property which in the early history of the mine produced such large quantities of rich ore was cut off by a huge fault, and appeared to be lost altogether. A considerable amount of development work has since been carried out for the double purpose of again finding the vein, and in looking for others, with the result that two strong veins of high grade have recently been opened up, which it is believed will entirely restore that company's original position, and greatly enhance the value of the interest held by the London and British Columbia Goldfields Company, which remains the same as when last reported.

THE YUKON GOLDFIELDS.

The working conditions have, however, so much improved that, with the reduced royalty tax and the change made in the company's local management, better results are anticipated from this season's work.

The London and British Columbia Goldfields Company's interest in this company has been taken into the accounts at a very low figure in order to derive the full benefit of any improvement in the general position.

THE KETTLE RIVER POWER COMPANY.

This company has been formed to carry out and develop the concession of the provincial Cascade Company for utilising the Cascade Falls of the Kettle River for the purpose of generating and supplying electricity for power to the towns, mines, smelters, and other undertakings within a radius of 40 miles of Grand Forks City. Within this area are contained the Rossland and Boundary Districts, already the most important mining districts of British Columbia.

The advancement of the Boundary District has recently been so appreciable that it is confidently expected that that district alone will require more power than the Kettle River Power undertaking will be able to supply when developed to its full capacity.

The large margin between the cost oi generating steam power and that at which the Kettle River Power Company is able to provide power, ensures a substantial profit to the undertaking.

As the result of these arrangements the London and British Columbia Goldfields Company will hold debenture stock to the value of the works already completed, together with an exceedingly large block of ordinary shares, which form an asset of great value, thus establishing the deal as being an exceedingly satisfactory one.

THE ALMA GROUP OF CLAIMS.

These form a group of four claims consisting of about 150 acres adjoining the Ymir mine on its western side, and into which the Ymir vein runs should its general direction—as at present opened up—be maintained.

As the Ymir Company have allowed their option over these claims to lapse, steps have been taken by the London and British Columbia Goldfields Company for definitely opening up the Ymir vein on the Alma group, the importance of which is obvious.

GROUP OF CLAIMS—LARDEAU DISTRICT.

This is a large and exceedingly important free milling gold property, situated in the Lardeau district of British Columbia, and easy of access. The London and British Columbia Goldfields Company has recently secured a working option on the property upon terms which appear to be very satisfactory, and the work of opening up the mine is now in progress.

There exists upon the property several large and distinct veins varying in width from 3 to 55 feet, upon three of which work has been done, and all carry gold values varying from a few dollars to the ton to that of very high grade ore.

NEW COMPANIES.

ONTARIO.

Beaver Oil & Gas Company, Ltd —Incorporated 26th July. Authorized capital $250,000, in shares of $50.00. Head Office: Brantford, Ont.

Canadian Oil Refining Company, Ltd.—Incorporated 7th August, 1901. Authorized capital $100,000, in shares of $100.00 each. Head Office: Petrolia, Ont.

Kent Oil & Gas Company, Ltd.—Incorporated 7th August, 1901. Authorized capital $50,000, in $10 shares. Head Office: Dresden, Ont.

Ontario & California Oil Company, Ltd.—Incorporated 7th August, 1901. Authorized capital $1,000,000, in 25 cents shares. Head Office: Toronto, Ont.

BRITISH COLUMBIA.

Fraser River Gold Dredging Company, Ltd.—Incorporated July 11th, 1901. Authorized capital £15,000. Formed to acquire options for and to purchase and obtain leases or concessions of gold mines and timber in British Columbia. Head Office: 14 Arcade St., Ipwich, London, England.

COMPANY NOTES.

Scottish Colonial Gold Fields.—At the meeting of the Scottish Colonial Gold Fields, which was held recently at Edinburgh, reference was made to the Idaho-Alamo group of properties in the Slocan in which the company is interested. The directors intend to erect an aerial tramway which will be completed by next summer, and in the meantime intend to push developments in the mine. Arrangements have been made to provide an additional sum of £12,000 as working capital, by selling a portion of the company's interest in Australian undertakings. The Board anticipates regular dividends from their Slocan property, when thoroughly equipped and developed.

The Hall Mining and Smelting Company.—The mine manager reports that the main shaft is finished down to the tenth level, and that he is now driving on the ninth and tenth levels eastward, to reach the ore bodies found in the levels above. Copper Smelting: There being now sufficient ore in sight, the Board decided to start the small furnace (No. 1) on copper ore from the Company's mine, and the furnace was blown in on the 9th instant.

Brandon and Golden Crown.—The shareholders of the Brandon and Golden Crown Mining Company have agreed to reorganize on an assessable basis. The new undertaking, to be known as the Golden Crown Mines, Limited, will be capitalized in the same sum as the old concern, viz.: 1,500,000 dollars. The dollar shares, however, will only be paid up to 95 cents when issued in exchange for the old stock, and the balance will be called up in monthly instalments as the directors deem advisable. By this means a working capital of 75,000 dollars will be provided, a sum thought to be sufficient to fully demonstrate the merits of the property. The mine, previous to its being closed down, sent out to the smelter something over 2,000 tons. The freight and treatment rate, however, was such that the directors did not feel justified in paying it any longer, especially as the smelter company at that time declined to reduce the figure unless a contract for a specified tonnage was entered into, or unless the entire output of the mine was sent to the Trail smelter for one year at a fixed rate. With the working fund to be provided to continue development, shipments will not be necessary to raise money for this purpose, and consequently the best efforts of the management will be confined to exploiting the property with a view to making it a mine. Besides the old 322-foot tunnel the Golden Crown is developed by a main shaft down a depth of 322 feet, with drifts at the 100, 150 and 250-foot levels. To date the total number of feet of work done is 2,443.

Le Roi Mining Company.—The secretary has addressed an important communication to the *Financial News* in which he states: The financial position of the company on June 1st, as follows:—

Assets.

Matte in transit to refinery	$400,000
Matte in course of treatment	150,000
Ore in smelter yard	431,200
Ore purchased	60,000
Supplies, coke, etc	25,000
Expenditure on capital account	37,000
New construction smelting works	12,500
	$1,115,700

Liabilities.

Debt to Bank of Montreal	$380,000
Advance from bank on second-class ore dump	150,000
Monthly expenses	219,900
	$749,900
Balance assets over liabilities	365 800
	$1,115,700

Granby Consolidated.—The first ordinary meeting of the company for its election of directors and other business was held in Montreal on the 26th instant. Good progress in the work of enlarging the smelter is being made. The labor troubles in the United States however have delayed the completion of some of the machinery. One carload of electrical machinery arrived

this week, and two additional carloads, with other machinery, are expected before Saturday. The power house is being enlarged and the extended foundations have been completed. The power plant will be increased by a 250 horse power horizontal turbine water wheel and a 250 horse power electric generator directly connected with the water wheel, making a total of 850 horse power developed for the use of the smelter. This is exclusive of the 250 horse power developed for the city of Grand Forks, the total power thus developed on the Kettle river being 1090 horse power. There will also be added an additional triplex power pump, which will supply an additional 750,000 gallons of water daily for granulating the slag and for the water jackets. The enlargement of the smelter building is also in progress. It will contain two furnaces, making the total capacity 1,300 tons daily. The new No. 5 gyrator crusher in the sampling works will increase the crushing capacity 1,000 tons daily. The converter building now being erected will be a steel fireproof structure 160 x 68 feet, its height in the main portion being 35 feet. The contract for its construction was awarded to the Hamilton Bridge Company of Hamilton, Ont. This building will contain two stands of converters of the horizontal barrel type. The shells will be 72 inches in diameter by 100 inches in length. Each stand will have three extra shells. This building will contain a 40-ton electric travelling crane for handling the shells and matte; in another portion of the building will be a 20-ton reverberatory tilting furnace. In the same building there will also be the quartz crushing plant and grinding pan for mixing the converter linings. Under each converter stand will be three mould-carriers, and these will be operated back and forth by a hydraulic ram. The converters as well as the tilting furnace will also be operated by hydraulic power. Near by the converter building will be the engine room, in which will be located the blowing engine for blowing the converters; also the dydraulic pump which will furnish the pressure to operate the various machines in the converter building The blowing engine will be run by a belt from a 20 horse power alternating motor. It is of the power type, has an air cylinder 36 x 36 inches and has a special unloading device attached, so that when the pressure reaches a maximum of 12 pounds the valves are so arranged that they remain open and no power is consumed when the converter is not using air. This unloading device was especially built for the Granby company, and has never been used on any low pressure blowing engine employed for converter purposes.

St. Eugene Consolidated.—Charles Biesel, superintendant of the St. Eugene states that a crew of 90 men is employed in the mine on development exclusively. The work in hand consists of sinking on the Lake Shore and the extension of the horizontal workings on the other claims comprising the St. Eugene. The big concentrator is shut down, and it is probelmatical when it will resume. The London market for lead shows no signs of imdrovement; in sact there is a decline rather than otherwise.

The Ymir Gold Mines.—The directors have declared a further interim dividend of 1s. per share, free of income tax, payable on the 24th instant. The secretary adds:—I am also pleased to say that a mail to hand yesterday confirms in the most satisfactory manner the information cabled and published on the 25th ultimo with regard to the rich developments in No. 4 level. Careful tests of samples taken from the cars as they came from No. 4 level (600 feet below the surface) showed a value of over £8 to the ton of ore for a width of 15 feet. The importance of these developments will at once be apparent when it is recalled that the average value of the ore from which past profits have been derived was only about £2 10s. per ton.

British Columbia Copper Co.—This company owning the Mother Lode mine, has ordered another furnace for its smelter at Greenwood. The new furnace will be similar in construction to the one now in operation and which has had an uninterrupted and very successful run ever since it was first blown in, on February 18th of the current year. It is a stack furnace, the down take going from 12 feet above the feed floor up some 15 feet and then down into the big main dust flue. The size of the furnace is 42 inches wide by 150 inches long, inside dimensions at tuyeres, of which there are 10 at each side, of 3 inches diameter. The Allis Chalmers company (successors to the E. P. Allis Co., who manufactured the first furnace), of Milwaukee, Wis., are building the new furnace, the construction of which will take about 60 days. Allowing for time that will be occupied in delivery at Greenwood, and in construction, it will be between three and four months before the new furnace will be ready for operation. There is very little preliminary work to be done at the smelter, provision having been made at the first for two more furnaces. The steel furnace house will have to be enlarged, but the floor and the dust flue are ready for the putting in of the additional smelting facilities the new furnace will afford. The engines and boilers are sufficiently large to run three or four furnaces, but another blower will have to be added to provide for the increasing treatment capacity of the works. The nominal capacity of the furnace in use has frequently been stated in print as 225 tons. Its actual tonnage of ore treated since its blowing in is as follows: February, (10 days) 3,016 tons; March, 10,519 tons (daily average); April, 11,322 tons (daily average), 377½ tons); May, 11,830 tons (daily average, 381⅓ tons); June, 11,206 tons (daily average, 373½ tons). Total tonnage to June 30th, 44,877 tons; daily average for four months ended June 30th, nearly 398 tons.

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Full particulars of the work, salary, etc., may be obtained from the Secretary.

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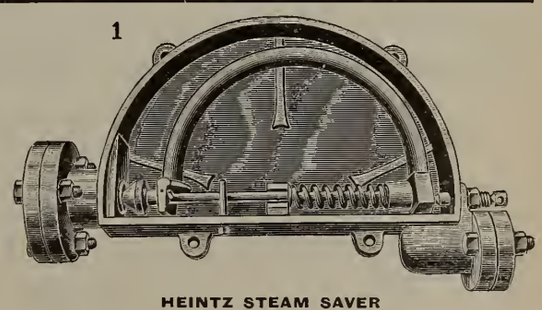

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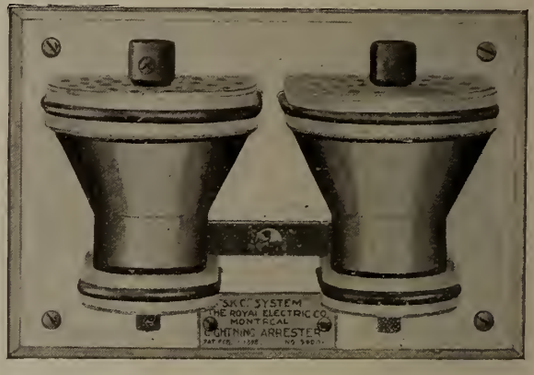

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1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

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Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nomiual fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

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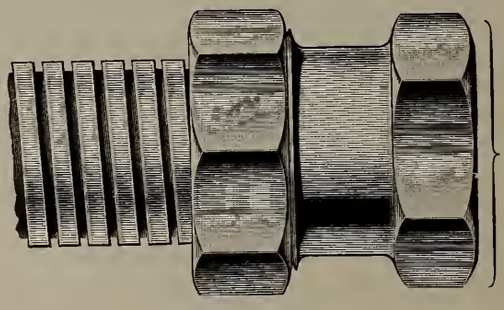

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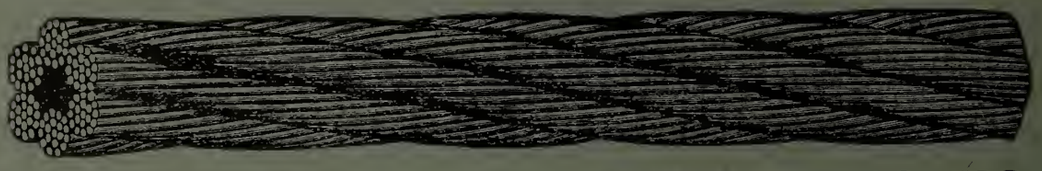

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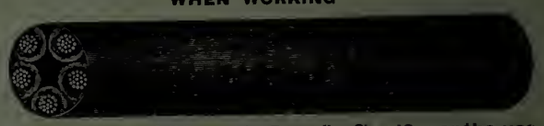

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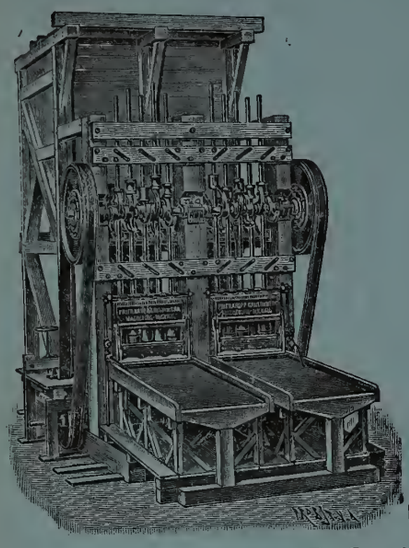

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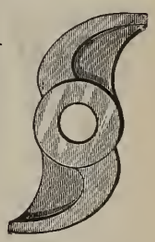

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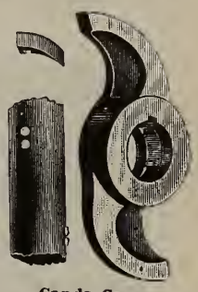

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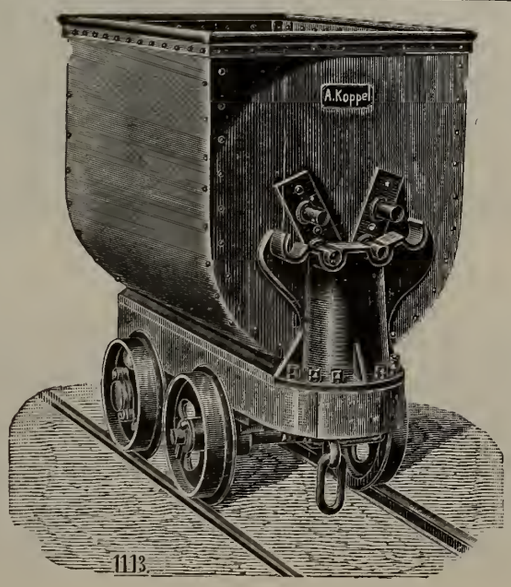

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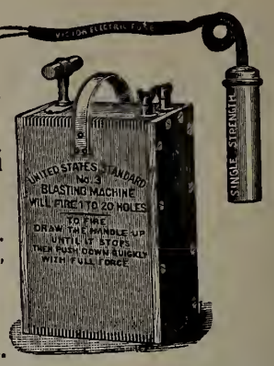

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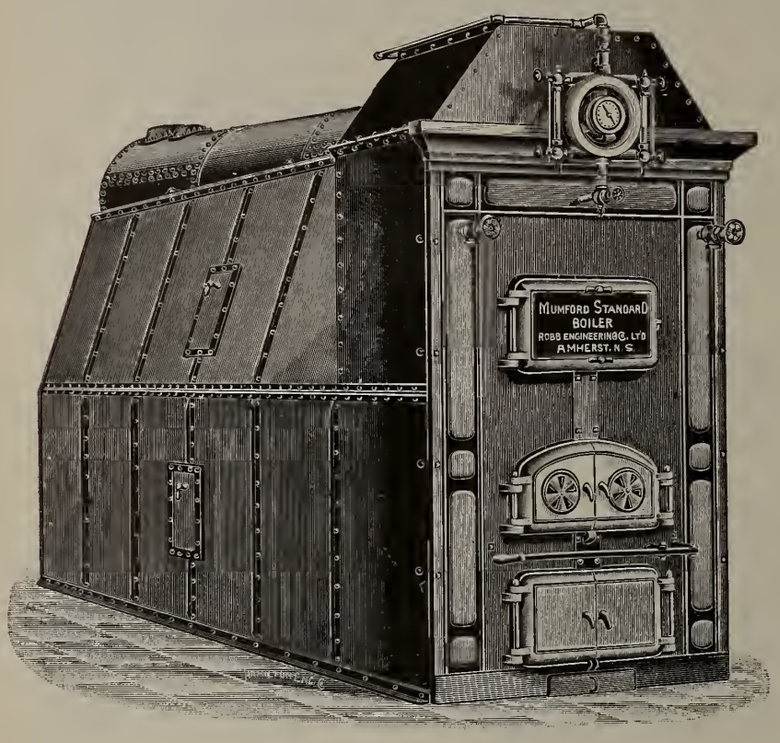

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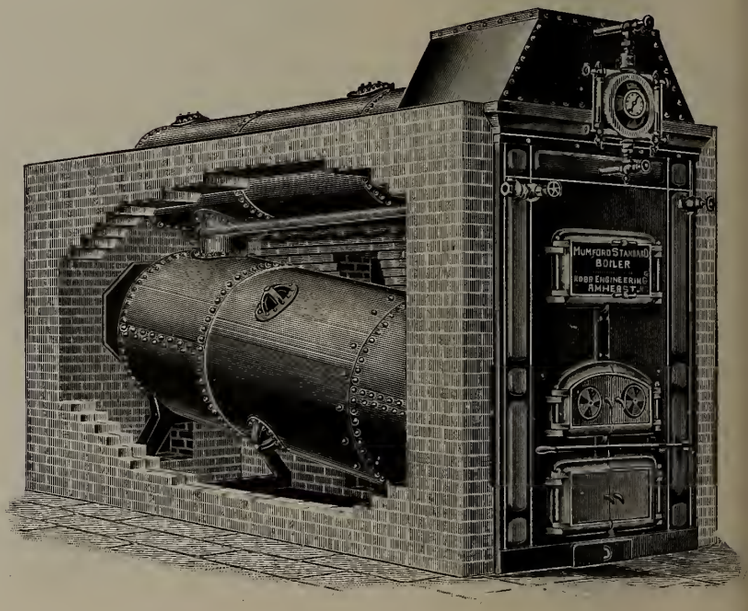

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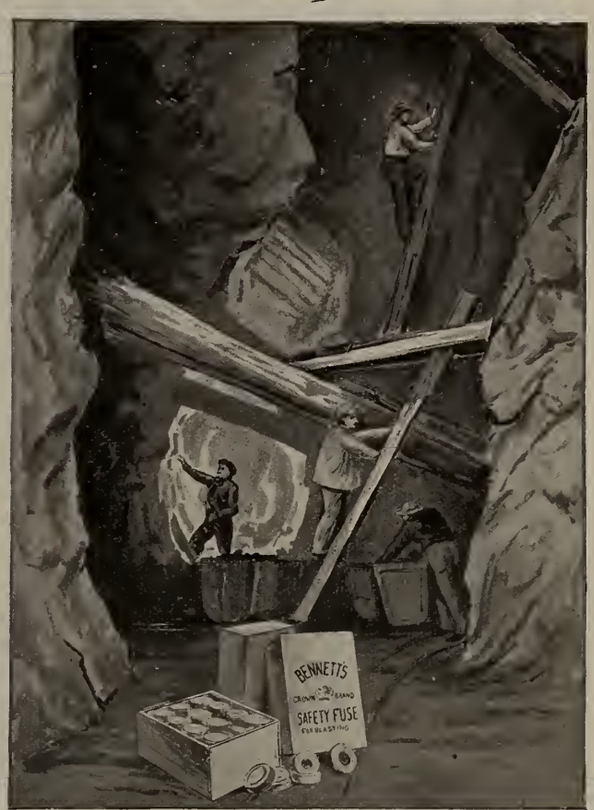

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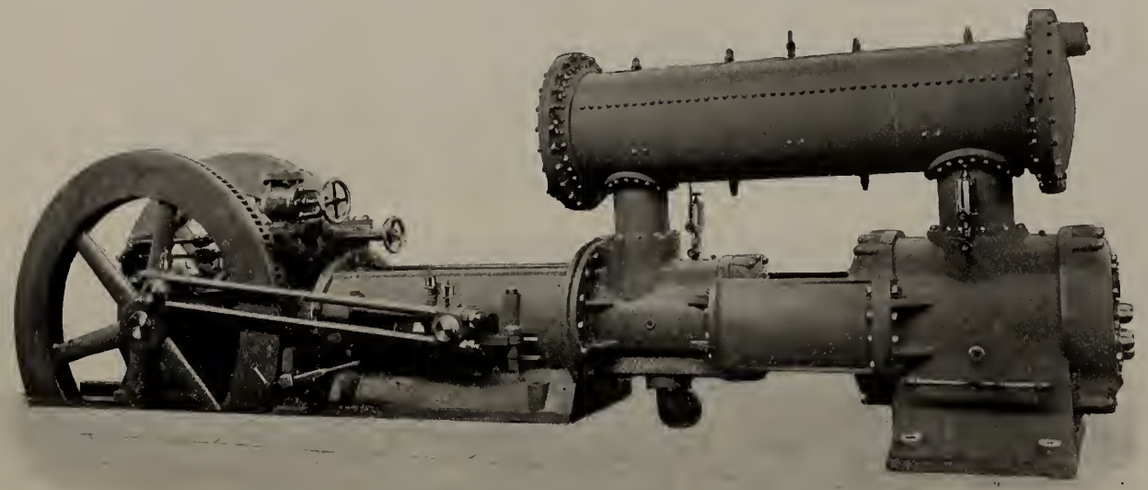

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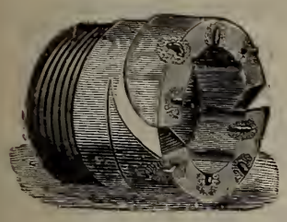

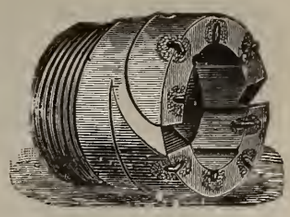

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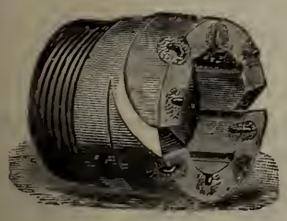

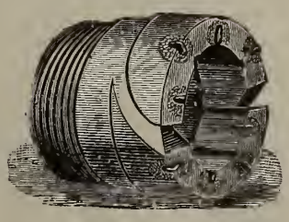

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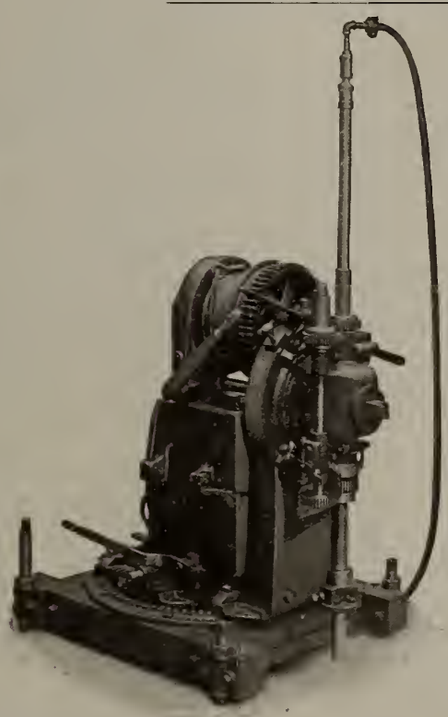

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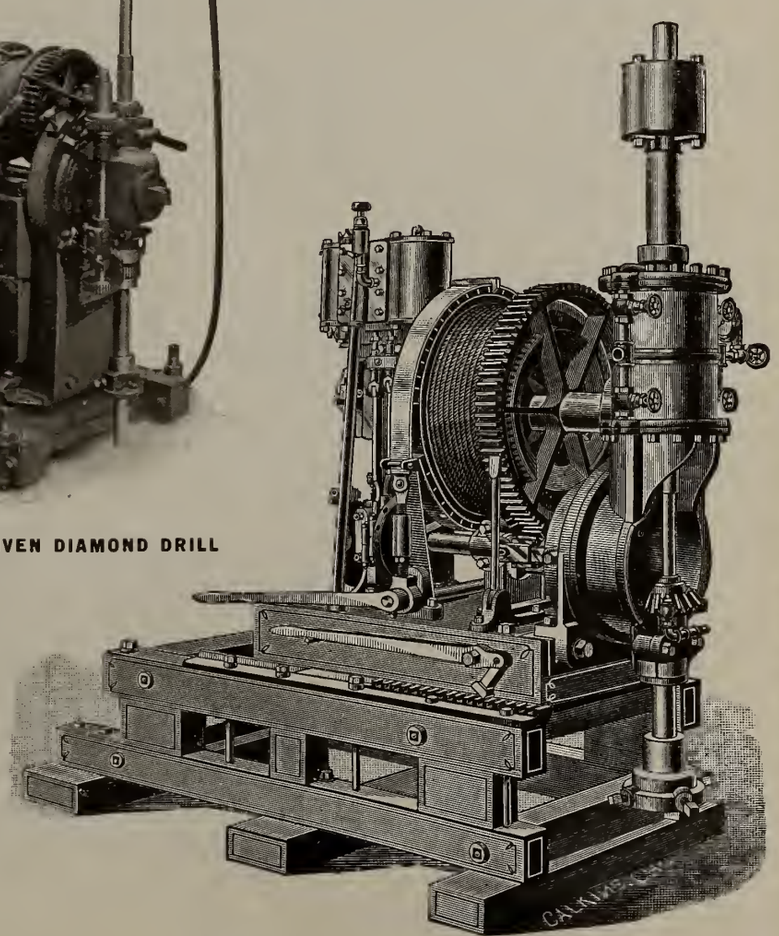

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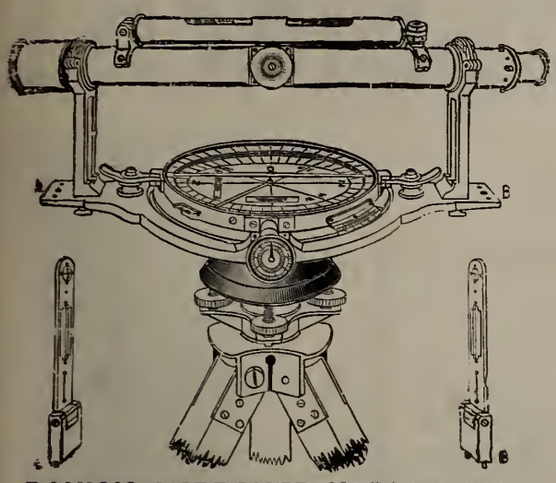

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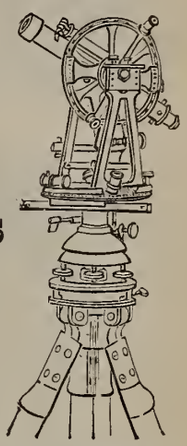

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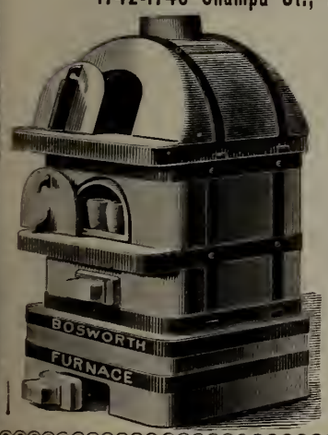

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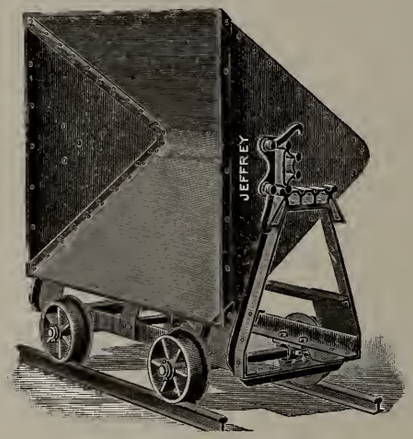

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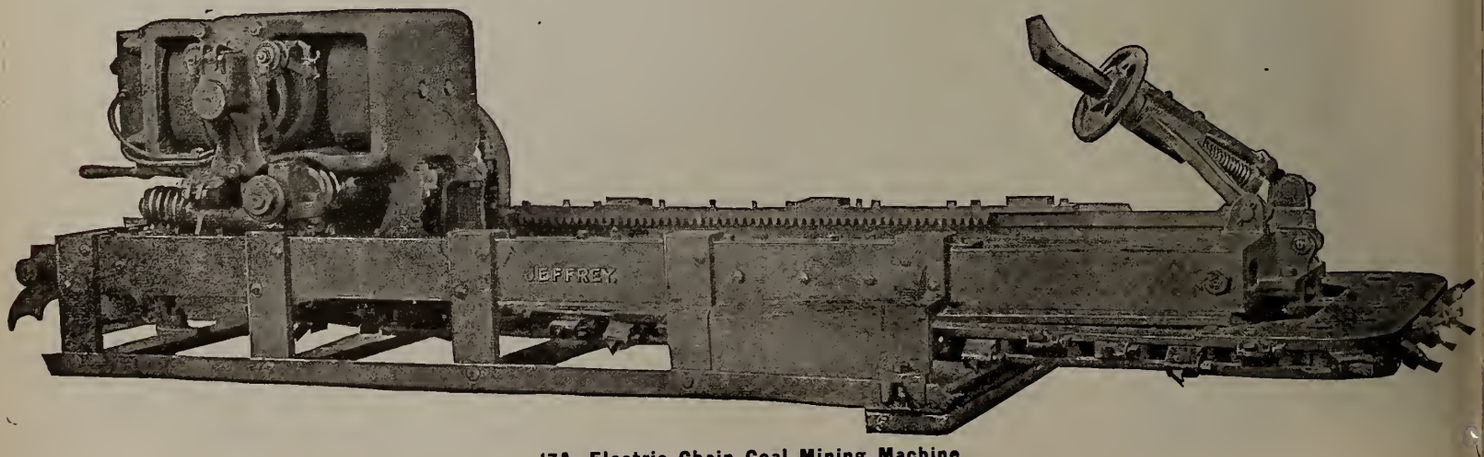

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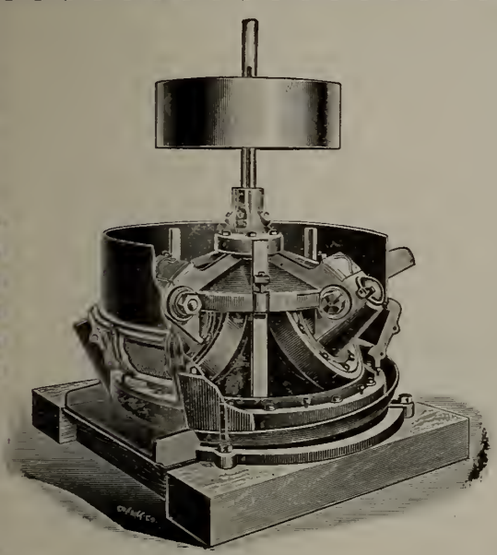

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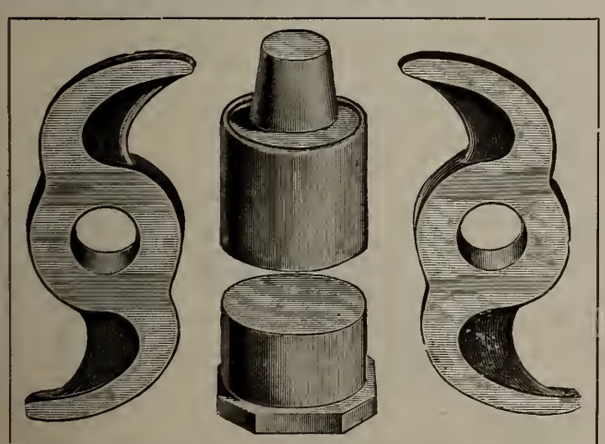

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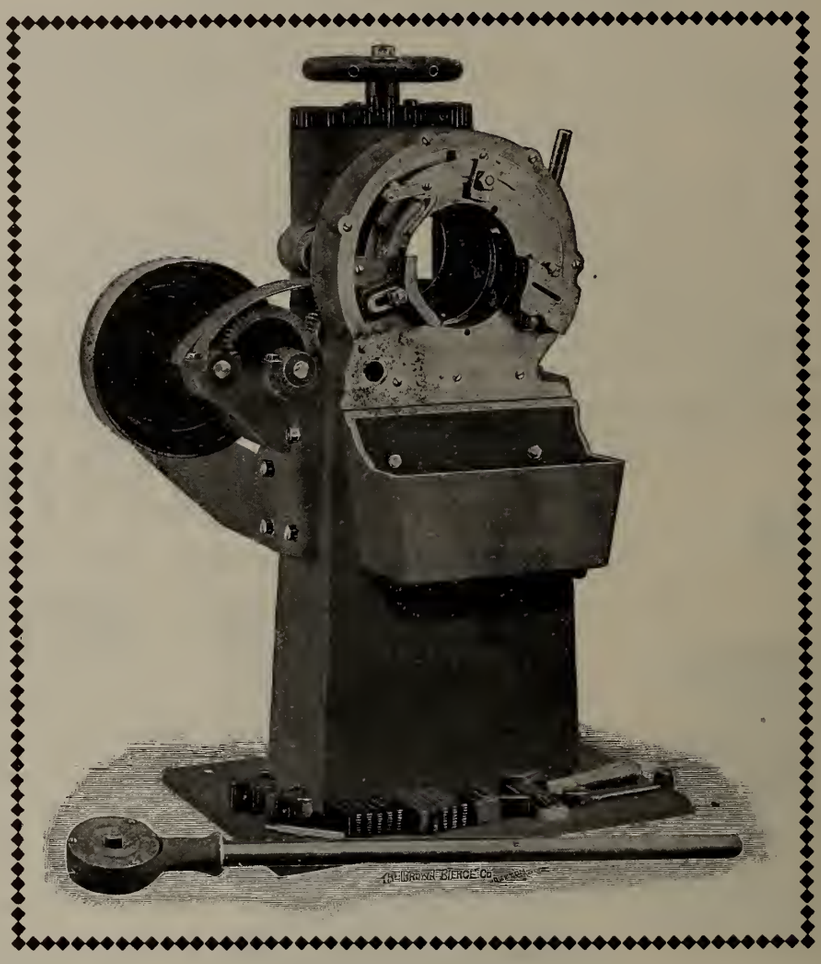

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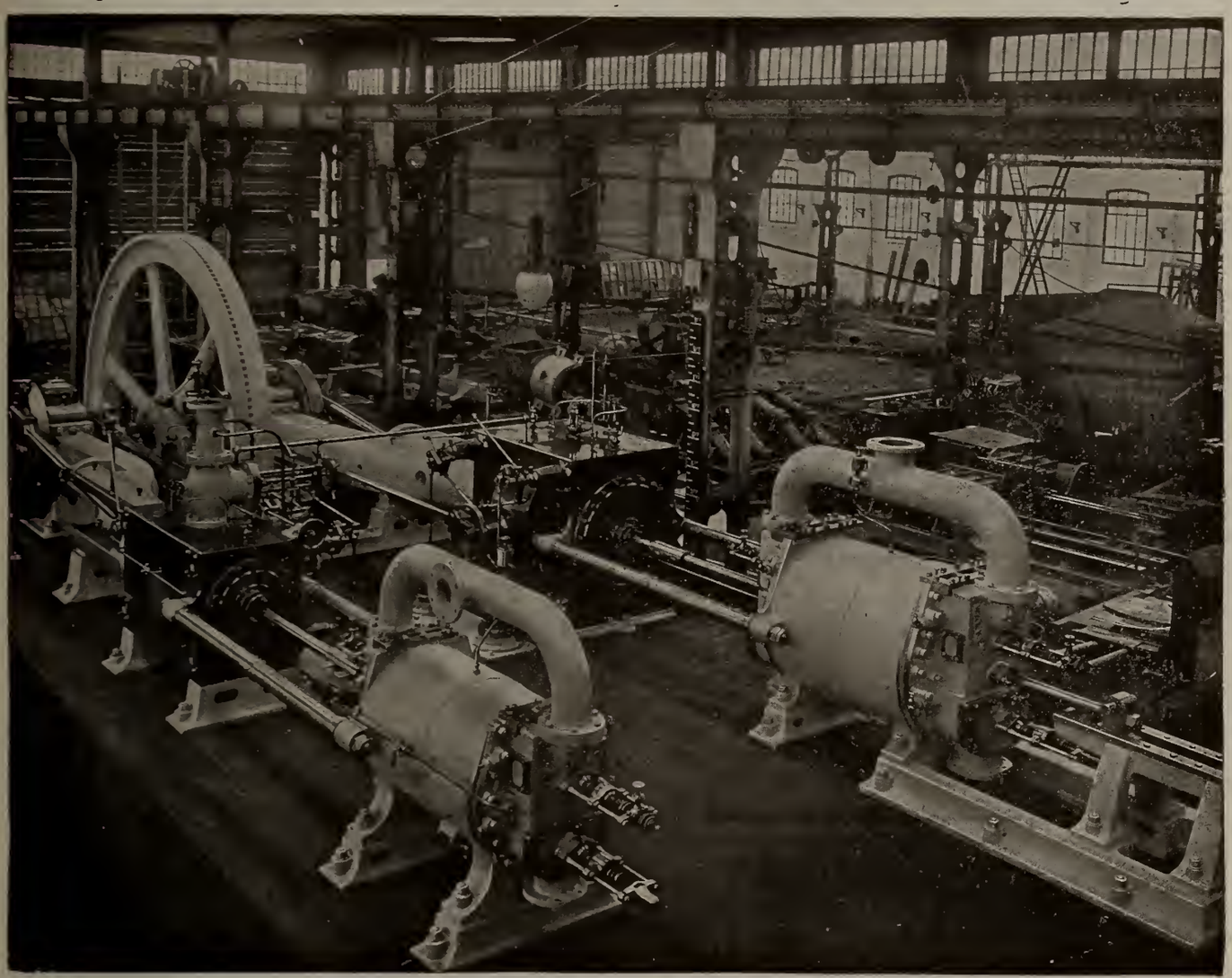

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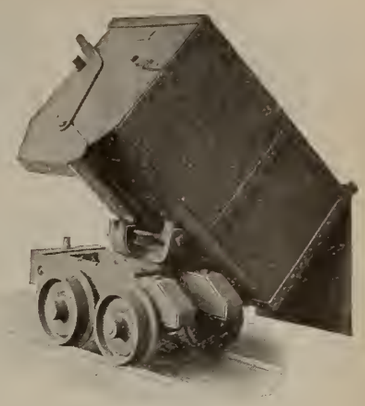

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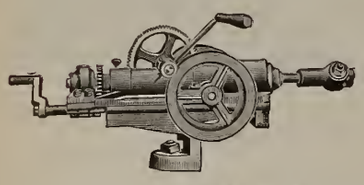

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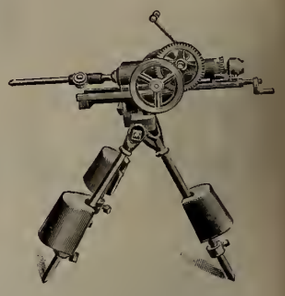

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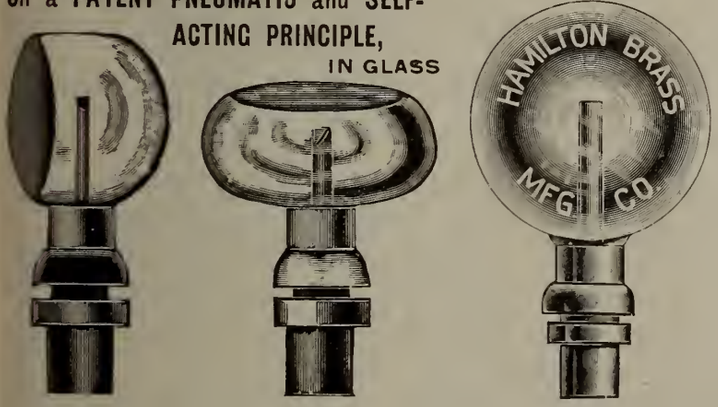

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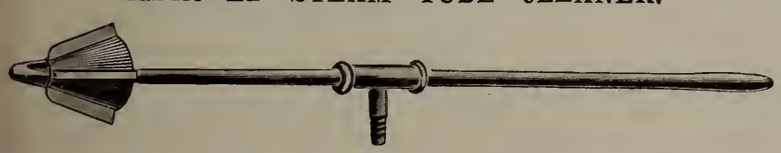

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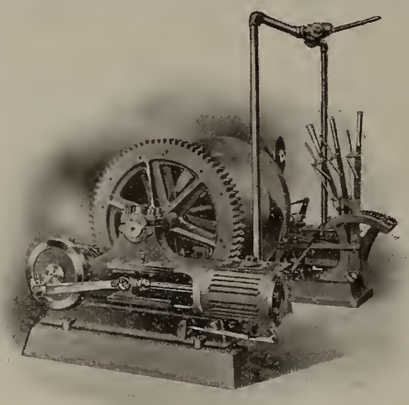

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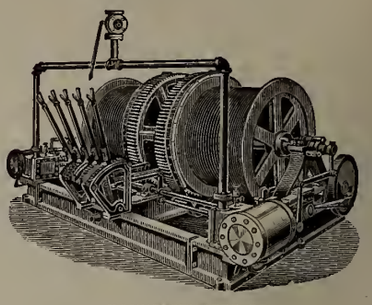

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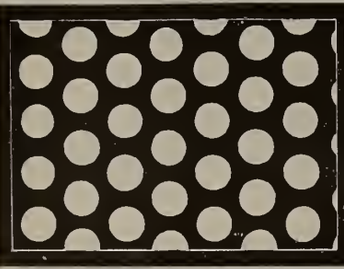

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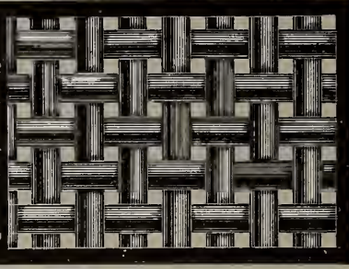

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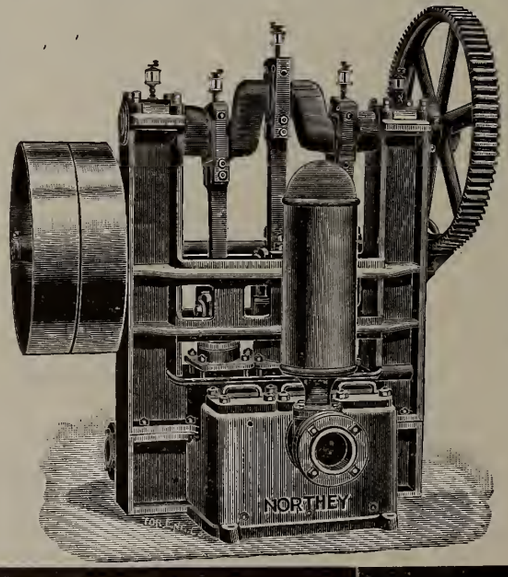

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Choice Methods of Finance.

The report of the official receiver of the winding up of the British America Corporation furnishes some remarkable disclosures of the methods of financing the affairs of this enterprise, the Le Roi, and its other subsidiary undertakings in Canada.

The British America Corporation was floated in December, 1897, by the London and Globe Finance Corporation, and was to acquire from the parent concern certain "options, concessions and properties," for which £500,000 in shares was to be paid. The London and Globe interest in these properties, however, consisted only of options to purchase, "and," to quote Mr. Barnes, "no concession or property was in fact sold to the British America Corporation, as suggested by the prospectus" On the deal the London and Globe made a large profit; but beyond the statement in the prospectus that shareholders subscribing to the British America Corporation issue would, in addition to such dividends as might be earned, also receive "their share of the profits accruing to the London and Globe by means of this issue," no mention was made of this essential fact. The issue was a success, and the company started business with a cash capital of about a million sterling. Mr Barnes groups the operations of the corporation under the following heads:—(1) The acquisition of mining claims and properties in British Columbia; (2) the acquisition of mining claims and properties in Yukon and the conduct of trading operations in that district; and (3) the purchase and sale of shares on the London Stock Exchange and the conduct of financial transactions with the London and Globe Finance Corporation and kindred companies. For the detailed accounts of how these various branches were carried on we must refer the reader to Mr. Barnes's report, paragraph 14 *et seq.*

The Le Roi deal, however, is of more than passing interest to readers. The directors of the British America Corporation authorized the resident director in Canada, Mr. C. H. Mackintosh, to purchase a controlling interest in the company owning the Le Roi mine at a price not exceeding £250,000. After some negotiations 270,676 shares (out of a total 500,000) were eventually purchased at $6 per share. The minority shareholders managed to make a better deal with the British America Corporation directors, obtaining $8.50 for their holdings. This caused trouble, and the matter is still *sub judice* in the Canadian Courts. But the result of this purchase of Le Roi shares was the discovery on the part of the British America Corporation directors that they had bitten off more than they could chew. Accordingly, the London and Globe was invited to co-operate in the Canadian business and to share on equal terms any profits which might accrue. The London and Globe, being controlled by practically the same board, naturally agreed, and half the cost of the Le Roi shares was charged to this company. The Le Roi mine, which had been bought for £725,000, was sold to the English company for £950,000, the profit on the transaction, after meeting all expenses, being £164,315. The next move was to create three additional British Columbia companies—namely, the East Le Roi Mining Company, the West Le Roi Mining Company, and the Columbia Kootenay Mining Company, each with a capital of half-a-million sterling, and each paying for the various properties acquired from the British America Corporation £400,000 in fully paid shares. These companies were never publicly issued, but the outcome of this juggle was the inflation of the British America Corporation assets from £294,665 (representing the moneys paid out in connection with these mines and claims) to £1,200,000, being the face value of the shares in the above-mentioned companies accepted as payment for the transferred properties.

Later on the West Le Roi transferred all its interests, less claims valued at $38,117, to the Le Roi No. 2, Limited, receiving for claims, valued originally at $437,000, £550,000 in cash and shares. The East Le Roi subsequently transferred in cash and shares. The East Le Roi subsequently transferred claims valued at $320,000 to the Rossland Great Western Mines, Limited, for £450,000 in cash and shares, retaining only one claim, originally valued at $16,000. The Columbia Kootenay sold claims originally valued at $250,000 to the Kootenay Mining Company, Limited, for £350,000 in cash and shares, retaining one claim valued at $10,000. The properties not included in the transfers to the new companies were withheld, Mr. Barnes learns from the secretary of the British America Corporation, "because little (if any) development work had been carried out by the corporation upon them." Yet we find the directors of the British America Corporation, in their statement of the corporation's assets, putting down 432,000 shares in the Columbia Kootenay as "estimated to produce" £229,312, 433,000 shares in the East Le Roi as "estimated to produce" £49,163, and 437,000 shares in the West Le Roi as "estimated to produce" £181,491—or in every case to realize exactly what they cost the corporation! And this, let it be noted, after what we may assume to be the cream of the assets had been transferred to other companies!

That the financial operations of the corporation were peculiar will surprise no one after the above-mentioned disclosures. One sample of the juggling which was practised will be sufficient—others can be discovered by the curious in Mr. Barnes' report. Between September, 1897, and September, 1898, the British America Corporation had lent the London and Globe £629,699, of which £442,223 was repaid in cash, leaving £187,475 due from the London and Globe. This indebtedness, however, was changed into a debt of £82,524 due from the

British America Corporation, to the Globe, by transferring to the British America Corporation, at a price of £270,000, 100,000 Standard Exploration shares, 100,000 Victorian Gold Estate shares, and 70,000 International Nickel Corporation debentures. The Globe subsequently repurchased the Nickel debentures at par. The London and Globe, indeed, seldom allowed the British America Corporation to scoop the pool in any of these deals. The latter did manage to make a profit of 2s. per share on a block of Nickel Corporation shares, but the result, according to Mr. Barnes, "was a gift without consideration of £26,411 by the London and Globe to the British America Corporation." Then it was determined to balance the British America Corporation's books on November 28, 1899, and on that date the London and Globe paid to the British America Corporation £264,110 for shares repurchased. This transaction increased the balance of cash at the corporation's bankers on the date of the balance sheet from £2,697, to £266,807, and the corporation's profit by £26,411. The directors on this balance-sheet—which showed a total profit of £601,501, consisting of £148,833 realized profit and £452,667 unrealized paper profit—declared a cash dividend of 10 per cent., absorbing £150,000. We know the value of some of these paper profits, and we are not surprised to notice Mr. Barnes's remark that "in the circumstances the legality of the dividend of £150,000 will have to be carefully considered."

The Lead Situation.

A most undesirable condition of affairs exists at the present time in connection with the Canadian lead industry. Boiled down to few words the situation is that circumstances have combined to make the production of lead ores so unremunerative that the greatest producers in the Slocan and East Kootenay districts of British Columbia are either shut down completely or devoting their attention exclusively to development work pending a turn in the market that will restore prices to a basis that will leave a reasonable working profit for the mines.

The question of making lead mining profitable in British Columbia is one of the greatest problems that the country has to face, and it is a fact, unfortunate too, that the legislature of the province has manifested little or no insight into the question, otherwise matters might have taken a turn earlier in the year.

From the time the Canadian lead first figured in the world's output, practically in the early '90's, up to January last, prices fluctuated from time to time, but lead ores could always be mined at profits that offered a strong inducement to operators, and the production increased rapidly. The purchasers were the Canadian smelters at Nelson, B.C., and Trail, B C.; the Everett, Wash., smelter and the American Smelter Trust. The bulk of the ore went to the latter institution. The Canadian Pacific railroad held the lead industry in the hollow of its hand by reason of controlling the transportation throughout the producing districts and when the big road fell out with the Smelter Trust, the miners were ground between two stones and came out of the ordeal decidedly the worse for wear.

The American Smelting Trust's contracts with British Columbia lead producers expired at the first of this year and when it came to a question of renewals, the Trust demanded from the Canadian Pacific some concessions in the matter of rates. There can be no argument as to the justice of the demand in many instances. The case of the St. Eugene mine, the biggest producer in the country, may be quoted as an example. The property is located on the Crow's Nest road, a section of the Canadian Pacific system, and over this section the ore from the St. Eugene was hauled for a distance under 50 miles to the junction of the Kootenay Valley road, a link in the Great Northern system. The Canadian Pacific railroad people charged for this haul more than half as much as the Great Northern road charged the Trust for transporting ores from the Cœur d'Alenes in Idaho to the Missouri river, a haul of over 1,000 miles. Other instances of a similar nature might be quoted, but the sample is sufficient to demonstrate what the Trust described as a system of "hold-ups" under which they could not do business. The result of the rate jangle was that the American Smelting Trust, which had stood ready to contract for more than half the entire output of the country, retired from the field and refused to do business with the mines of British Columbia.

Thus robbed of its principal market for lead ores, the British Columbia lead trade turned to the home smelters for a market. With the big American company out of the field, the Canadian smelters lost no time in raising rates a few dollars, thereby putting another twist in the suffering lead producer. Moreover, the Canadian smelters did not have the capacity to handle half the output of the country, and had the Everett smelter not come to the rescue, the situation would have been worse than it actually is. The net result was ultimately to close down the producers of high grade lead ores. The St Eugene, with immense bodies of ore and a shipping capacity of 3,400 tons of 66 per cent. concentrates per month, sent the product of several months' work to the Guggenheims in South America, and then worked for several months on a large order for concentrates to be shipped to Antwerp, Belgium, but these artificial helps soon "petered out" and the biggest lead properties on the continent are now idle save for the employment of 100 men on development work. The same thing applies to other high grade lead properties. In the Slocan most of the ores carry a high percentage of silver and many of the mines under this head continue to ship to the smelters, satisfied to make the lead values pay for the cost of production and accepting the returns from the silver values on which to figure out a profit.

The slump in lead on the London market hit British Columbia lead producers hard. At present quotations on the London market, where all Canadian lead is marketed, the product nets British Columbia operators $1.50 per hundred, at which the margin of profit is infinitesimal because of the cost of producing under working conditions appertaining in the province.

The question of a remedy for the trouble has vexed British Columbians for many months. It was believed that the establishment of a Canadian refinery would solve the problem, inasmuch as the enterprise would place the Canadian product on an independent basis in the matter of securing a market. Finally the agitation of a refinery took active form in the shape of a strong delegation from the Kootenay country which visited Ottawa and induced the Federal Government to grant a subsidy on refined lead. The bonus is made to cover a period of five years, with the proviso that it should not exceed $200,000 in any one twelve-month. For the first year the subsidy is to be $5 per ton, second year $4 per ton, third year $3 per ton, fourth year $2, and fifth year $1. The bonus is, presumably, to cover the charges of interest account to accrue on refinery stock while a market is being secured for the product. Up to the present time nothing has eventuated in the shape of a definite proposition to construct a refinery, and it is now agreed that the Canadian Pacific railroad must go ahead with the refinery if it is to be realized in the near future. The general impression is that the Canadian Pacific railroad has the proposition in hand and that a move will be made at an early date, but nothing definite has been announced.

In the meantime the lead industry is suffering severely. It was estimated during the closing months of 1900 that the production of lead for the present year would aggregate 120,000 tons, instead of which the aggregate output for the first six months of 1901 is slightly under 30,000 tons, or at the rate of less than one-half of what was regarded as a reasonable estimate. The St. Eugene mine alone contributed

9,000 tons and as that property is closed down with several other considerable shippers, it is regarded as extremely likely that the total tonnage for the year will be considerably under last year's total of 66,450 tons. An increase in the London quotations would substantially stimulate the industry, but as this is not in sight at the present time, mine-owners are fain to look forward to the promise of a refinery with the attendant reductions in charges, which it is claimed would net the producer not less than $3 per ton more than he receives at the present time on lead in ore.

The History of Mining in Newfoundland.

Mining in this ancient colony has had almost as checkered a history as that of the island generally. Truly as Lord Salisbury said that "Newfoundland has been the sport of historic misfortune."

Scarcely half a century has elapsed since the first bold adventurers dared attempt to prove that the country really possessed some mineral wealth, but their efforts were not successful for a long time, and they themselves were looked upon as persons having decided tendencies to lunacy. It is indeed related that about this period an old Scotch miner who was seen prospecting around Notre Dame Bay, was reported to the authorities at St. John's as "a poor demented creature going about hammering at the cliffs but otherwise he appeared to be harmless."

It is true that long prior to this date, indeed from the very earliest records of the island, there would appear to have been a vague suspicion that it might possibly possess some minerals of value, for we learn that Sir Humphrey Gilbert, who took possession of it in the name of Queen Elizabeth, in 1583, had with him a mining expert whom he despatched on a prospecting tour along the coast. This expert is reported to have gathered many specimens of ore supposed to be rich in copper, iron, lead, and silver. To quote from the narrative of the voyage, "One Daniel, a native of Saxony, a very expert miner and assayer, brought to the General a piece of ore of which he said he would stake his life that it contained a considerable quantity of silver."

Sir Humphrey was greatly elated at the prospect of rich mineral wealth in his newly-acquired possession, but fearing lest the numerous Basque and Portugese fishermen, then on the coast, might get wind of the find he ordered all the specimens to be concealed on board ship till they were again at sea when he would cause assays to be made.

So confident was he of the value of this ore that he boasted to his friends, that on the credit of the mine, he did not doubt of obtaining from Queen Elizabeth the loan of ten thousand pounds (£10,000), to defray the expense of another similar enterprise. Alas! for the uncertainty of human designs, the poor mining expert with most of the crew, and all the precious ores, was lost on Sable Island in the "Delight," one of the ships of the squadron, and no more came of the brilliant prospects of Sir Humphrey's mining venture.

But the riches of the teeming waters laving the shores of Newfoundland, which were pronounced by Sir Francis Bacon in 1610, to contain more valuable treasure than all the mines of Mexico and Peru, and whose inexhaustible stores of wealth continue to this day as productive as ever, soon eclipsed all other enterprises, and obliterated for centuries even the very recollection of the island's more problematical mineral resources.

A few attempts at mining were however made later on, where indications of various minerals presented themselves in the sea-cliffs. The most noted of these was at a place called Shoal Bay, about twelve miles south of the Harbor of St. John's on the eastern Atlantic sea-board. Here, an opening was made upon some small veins of quartz about the year 1778, which revealed rich sulphurets of grey and yellow copper ore. The mine was abandoned after a short time, but reopened in 1837 by Captain Sir James Pearl, R.N., with no better result. What the outcome of these ventures was, it is impossible now to ascertain.

Strange as it may seem, people still have faith in this property, and others have taken hold of it from time to time; even as I write, a new local company just formed, is about giving it a further trial.

Desultory attempts at mining, chiefly for copper and galena continued to be indulged in thereafter, by the very few who had any faith in the country. Such persons were looked upon as cranks of the most advanced character. How could a country composed only of barren rocks and bogs be expected to produce minerals. It was the extreme of folly to entertain such an idea for a moment. Not at all, there was no getting over the fact that the all-wise Architect of the universe had but one object in creating this desolate rock, viz., as a place to dry fish upon. Such were the arguments used, at the time by the pessimists of the country.

One enterprising gentleman, who is justly deserving of credit as being the pioneer of the mining industry in the island, the late Hon. Chas. Fox Bennett, at length took up the search for minerals in downright earnest. About the middle of the last century Mr. Bennett obtained extensive concessions from the Imperial Government to search for and mine such ores as he might find on certain portions of the southern districts of the island, paying the usual royalty to the Crown, and he was able to interest capitalists in England to furnish the necessary funds to exploit his properties. Many rich deposits, especially of copper, were located by him on the shores of Conception, Placentia and Fortune bays. Beautiful samples of grey and yellow sulphurets, erubescite, and even native or metallic copper were obtained. Galena, accompanied by native and ruby silver, was also found at Laun in Placentia Bay, and for a time Mr. Bennett's prospects of amassing a rapid fortune looked bright indeed. But his capital gradually dwindled away, and the rich prospects failed to turn out according to promise. In fact, like most very rich ores of the kind, they did not seem to occur in any appreciable quantities anywhere, and Mr. Bennett eventually became a poor man. But with characteristic John Bull stubbornness (for he was a west-country man), he continued his search, to be crowned in the end with complete success. Having associated with him the late Mr. Smith McKay, a hardy and intrepid prospector from Nova Scotia, their efforts were rewarded in 1864 by the discovery of the Tilt Cove Copper Mine, in Notre Dame Bay, which to-day, after thirty-six years of continuous and successful development, holds first place amongst our copper mines. The shipment of ore from this property for the last calendar year reached 69,744½ long tons, while the gross profit of the company now operating it (the Cape Copper Co.), amounted, according to their last fiscal report, August 1900, to £66,349.12.5 sterling.

Though Bennett and McKay have long passed beyond that bourne whence none return, the Union Mine at Tilt Cove continues as prolific as ever, and with the high price now ruling for copper, this year will probably witness the greatest output in its history.

Needless to say, that during most of the above period the pessimistic views of the great majority still held sway, and actual pleasure followed each unsuccessful attempt to establish a mine.

When the success of Tilt Cove became assured it was no uncommon thing to hear it said, "Oh, well there may be one mine in the country, but there is not, likely, to be another Tilt Cove discovered." The more knowing ones, however, began to change their views, and after a while, prospecting, chiefly for copper, became general. Many

new discoveries of more or less promise were made in the course of a few years, and the copper craze reached fever heat about 1870.

Coincident with the opening of the Tilt Cove Mine, in 1864, was the establishment of the Geological Survey of the Island, under the late Alexander Murray, C.M.G., F.G.S. This gentleman was detached from the Survey of Canada, whereon he held second rank under Sir William Logan, and deputed to take up this new field of exploration. For twenty years Mr. Murray labored assiduously at his work. It was a labor of love with him, and in a short time he became convinced that the country's mineral resources gave promise of great future development.

At the time he took up the investigation, the island was literally a "*terra incognita*." Not a feature of its topography had ever been mapped out, beyond the mere fringe of coast, partly surveyed by the Imperial Government for navigation purposes. Many portions of the country, more especially the western and northern regions, were less known to the inhabitants of the more populated eastern and southern sea-board, and in reality actually more remote, than most parts of Canada or the United States.

Mr. Murray's first surveys of the interior were, indeed, a revelation. His description of the splendid rivers, large and beautiful lakes, extensive forests, and agricultural lands, but above all of its interesting geological and mineralogical features, were received by most people with the utmost incredulity, for old prejudices were hard to remove. Even up to the time of his retirement from the Survey in 1882, he failed to entirely dispel the immense mass of doubt and unbelief which surrounded the subject on all sides. It was a long and hard fight, and he was frequently tempted to give it up in despair. He left the country almost broken-hearted at finding his labors so little appreciated.

Slowly but gradually, however, a better feeling began to manifest itself, engendered by the actual opening and development of new mines, patent facts, which could not be set aside, and people came to look more favorably on the importance of the mineral wealth of the country.

Tilt Cove was followed in 1875 by the discovery of the Bett's Head Mine and in 1878 by that of Little Bay, two copper properties which for a time completely eclipsed it. Between the years 1875-85 Bett's Head Mine shipped to market 130,682 tons copper ore and 2,450 tons iron pyrites, and from the Little Bay Mine there were over 200,000 tons of 2,240 lbs. mined and shipped. This was chiefly of low grade, and when in the later eighties copper became so depreciated in value, both the latter mines ceased operations, and were allowed to get into such a state of disuse as to frighten capitalists from attempting to work them. The recent high price to which copper has attained, however, has had the effect of inducing new mining companies to again take hold of both properties, as well as several other smaller ones, upon the shores of the same great bay.

Numerous attempts at mining copper ores in a small way are being made in various other sections of the island to-day, and some, at least, are destined to develop into paying properties. Hitherto most of these attempts were confined to the district of Notre Dame Bay, but within the last few years other sections of the island are being exploited for copper.

A new mine has been opened at York Harbor, Bay of Islands, by an English company and at the present date is showing up most favorably. It is deep seated but probably all the more lasting.

The old Huronian series on the south eastern portion of the island in which the very first attempts at mining were made, is again, after the lapse of nearly a century, attracting attention on account of the numerous small deposits of high grade copper ores it is known to contain. Recent discoveries of native copper in amygdaloidal trap rocks, interbedded with metamorphosed strata in parts of Placentia Bay, have been made within the past twelve months. The similarity of the rock masses, and possible coincidence in geological horizon with your Lake Superior cuperiferous amygdaloids are points worthy of consideration. One of these is situated on an island called O'Derin, having a fine harbor open at all seasons to navigation. Although the average percentage of metal in these rocks is low, yet the exceptionally favorable position and surrounding circumstances generally, seem to point to a property capitalists might well take into favorable consideration. The metal is apparently disseminated in fine particles through the greater part of the Trappean rock, which is the prevailing material forming the southern half of the island, but in some instances it is concentrated in mass form.

The following is a list of the copper mines that are, or have been working within the past twenty-five (25) years.

Union Mine	Tilt Cove, Notre Dame Bay.
Bett's Head	Bett's Cove, " " "
Burton's Pond	" " "
Rouge Harbor	" " "
Stocking Harbor	" " "
Colchester	S. W. Arm, Green Bay, " " "
Naked Man	" " " " " " "
Little Bay	" " "
Hall's Bay	" " "
Lady Pond	" " "
Sunday Cove Island	" " "
Rabbit's Arm	" " "
Thimble Tickle	Seal Bay, " " "
Leading Tickle	" " "
Batt's Hill Mine	Conception Bay.
Presque Mine	Placentia Bay.
O'Derin Mine	" "
Blomidon Mine	York Harbor, Bay of Islands.

It is true the copper boom of some years ago has subsided, and many of the smaller properties remain undeveloped, but the industry has settled down to sober earnest, and all the best properties are now taken up, even those abandoned some years back, and to-day we have a steady growing copper development which adds much to the mineral output of the country.

While there are many small copper properties in the island not perhaps sufficiently extensive in themselves to warrant the establishment of mines on an expensive scale, there is every reason to believe, were a smelting plant established in their midst, such as you have at Trail Creek, B.C., where small lots of ore could be treated on the spot, many of those might be wrought successfully; especially were our native coal brought into requisition in reducing the ores.

This is a subject I have frequently adverted to before and in a paper published in the English Mining Journal, for August 1897, entitled "Opening for mining investment in Newfoundland" I endeavored to draw attention to what I conceived would be a very paying investment in that direction.

Galena is a mineral distributed through many rock series in Newfoundland, but the best and most promising finds yet recorded were in the Pre-Cambrian or Huronian series of the Avalon peninsula. At least three localities in Placentia Bay have been fairly tested, two of which, the La Manche Lead Mine, and the Silver Cliff Mine, gave every indication of becoming successful ventures. Both are, however, closed down at the present time.

I never could ascertain whether it was the scarcity of ore, low price of lead, or mismanagement of the operations which caused this closing down, but I think the latter had most to do with it. When last seen by myself, both properties bore evidence of being rich in ore and I cannot believe there was sufficient work accomplished since that date to exhaust the mines.

The La Manche Mine was vigorously worked for a time by three different companies in succession. Between the dates 1859 and 1878 some 2,375 tons of galena were extracted from about 1,000 cubic fathoms of vein-rock, excavated, equalling an average of 2 26 tons of ore per fathom.

The galena occurs in a lode of calcspar mixed with fluor and barytes, which averages about three feet in width, but frequently widens out to six or seven feet. The vein follows a nearly vertical fissure with well defined hanging and foot-walls. It has been traced on the surface fully a mile. While the ore is irregularly distributed through the matrix, there appeared to be a nearly continuous string of prill ore in the middle from one to five inches in thickness. Many pockets or vughs filled with lumps of ore were met with throughout the workings.

The Silver Cliff galena was rich in silver, assaying in some cases as high as 400 ozs. per ton. But there was considerable blende and pyrites mixed with it in some parts. The Laun Mine was a fluor spar vein cutting porphyritic rock, and though not rich in galena contained pockets in which native silver, ruby silver, and chloride of silver were found in considerable quantity. It is stated that the miners, unacquainted with the character of the ores, especially the latter, shovelled it out over the cliffs into the sea, believing it to be some useless material.

I conceive that none of these properties received that careful or scientific treatment their contents warranted, hence the failure to make paying ventures of them.

Pyrites in deposits of more or less value, are of common occurrence in this country, and it is safe to say that it is more profusely distributed than any other known mineral substance. Though generally low in sulphur and iron, there are some few which would, under careful selection, prove valuable properties. Fully two-thirds of the ore from the East Mine at Tilt Cove is of this character, and much of it is used by the Cape Copper Co., at their sulphuric acid works, Breton Ferry, for the purpose of manufacturing this useful article of commerce. The old Terra Nova mine at Bay Verte, which was worked for copper even before the discovery of Tilt Cove, is also of this class. It only averaged about 1¼ per cent. copper, and as in those days pyrites was considered valueless, and its copper contents were too low to make it worth working for that substance alone, the mine was abandoned. Mr. Murray, writing of it in 1865, describes it as "an enormous mass of pyrites." The property was taken over last year by the Newfoundland Exploration Company, an American concern, who have unwatered the mine, and were so satisfied with its appearance that they are now about to begin operations upon it. But the most celebrated pyrites deposit yet discovered was at Pilley's Island, in Notre Dame Bay. An immense body of ore averaging over 50 per cent. in sulphur, was mined here for several years. The output from this mine between the years 1888 and 1899 reached 325,606 tons, valued at $1,685,338 in its crude state, as it left the country. In the latter year it closed down, but is being re-opened this season by the Newfoundland Exploration Company. Another large deposit of pyrites on Newfoundland Labrador is also being operated the present season.

Arsenical pyrites and pyrrhotite have been worked to a small extent, the former containing gold and the latter nickel, but in each case not sufficient to warrant much outlay. As, however, both minerals are pretty abundant, and no systematic attempt to test their value has been entered upon, it is quite possible that other deposits may exist showing a higher percentage of the more valuable metals.

Amongst other mineral resources, one that is destined to give prominence to this country, is the possession of large deposits of iron ores. The two hematite mines now working at Bell Island, in Conception Bay, are taking the lead as the most easily handled and cheapest ore mined in British America. The deposits, owing to their unique character and situation, have become world-famed. As your readers have been made familiar with them through your own and Mr. R. E. Chambers admirable articles on these properties, it would be superfluous for me to enter into a detailed description of them here. The output of both mines last year, notwithstanding the prolonged strike, reached 317,216 tons, which amount will, in all probability, be doubled this season. The completion of the great iron and steel works at Sydney, C.B., must call for an increased output on the part of the Dominion Iron and Steel Company, which is dependent to a great extent on this source of supply of the raw material.

To the enterprise of the Nova Scotia Steel Company, in exploiting this property, is due its present prominence, and had it not been for them, the valuable deposit would remain unutilized for years to come. Its existence was known for a long period, and mention is made of it by the historian, Anspach, as far back as 1818. None of our people took any heed of it, such is the absence of knowledge and enterprise here, yet, now that it has been made a success, and become such a valuable asset, it is a common thing to have a fling at the poor geologist, who did not long ago find it out and give the information to some friend, &c. Now, the facts are that ten years ago or less, any person who believed Newfoundland iron ores would ever be of value was considered a mad enthusiast. Had any of our people secured it, in all probability the property would have been locked up for generations, as many other valuable properties are, because the owners are unable or unwilling either to work them, or to make reasonable terms with those who would.

The Bell Island iron deposit was opened in 1895, when the first small cargo of 750 tons was shipped to the Ferrona works at New Glasgow. Since that date up to the end of last year, 824,236 tons have been raised and shipped. The future of this great deposit is assured, as the quality of the ore is excellent, and there is enough in sight to last for generations. The western half of the island also has ore deposits which must sooner or later come into use. Though the bands are not nearly so large, and appear to be somewhat inferior in quality, yet I can speak from personal observation when I state that there are millions of tons available.

New finds of iron ore are constantly being made, yet so far none have developed into mines. Whenever the day comes for the utilizing of the titaniferous magnetites, as come it must, Newfoundland possesses many deposits, one of which, at least, is known to be of immense extent, and is within a short distance of the sea-coast and railway. This is situated in the district of Bay St. George, and in close proximity to our most extensive coal field. With regard to coal the same skepticism still exists, and the failure of the Messrs. Reids' attempt to work the coal area surrounding the head of the Grand Lake, has unfortunately given color to this belief. Their non-success was not, however, due so much to the absence of material as to the methods adopted. All the same, their failure has tended to throw a damper upon coal mining, and has given to the pessimists a grand argument to support their utter disbelief in the existence of workable coal deposits in the island. Facts and figures, geological structure, discovery and measurement of existing coal seams, all count for nothing; the "I-told-you-so" prin-

ciple rules over all, and sets at naught all scientific data. Sooner or later our coal must be developed, and the high prices now ruling for that important item of fuel in our local markets, must inevitably hasten the opening up of the coal seams. While I do not pretend to say that we can compete with Cape Breton or Nova Scotia, in foreign markets, there is sufficient local demand to make it imperative ere long for some steps to be taken in this direction.

The extent of the petroliferous formation along the western and northern portions of the island is enormous, and should the boring operations now being conducted at one or two points prove the oil to exist in paying quantities, a boom in oil will certainly follow. Our pyroschists are situated at a lower geological horizon than any at present producing oil in America, and in that respect are a new feature in the history of petroleum deposits; all the same, the evidence obtained points to very favorable conditions, and the oil produced from the few borings so far made is of a high grade, especially in lubricating qualities.

The chromite mine, at Bluff Head, Port a Port Bay, ceased working last year, from what cause I am unable to ascertain exactly. It certainly, for a time, looked a most promising mine. The ore was excellent, and realized a splendid figure. While most of it exceeded 50 per cent. in chromic oxide, the concentrates were alsc easily brought up to that standard. Between the years 1895 and 1899, 4,737 long tons were raised from the mine. An English company now have it in hands, and, I understand, will soon recommence work upon it. In the meantime, two new discoveries of chromite have been made, one in the same neighborhood, and the other in the interior, at the head of the Bay d'Est River. Both are represented as extensive deposits, and are at present being examined by experts. Chromite is an ore which may be expected to occur at many points, where large bodies of serpentine and allied rocks are known to exist, and indications of the ore are frequently met with.

During the present summer, quite an excitement was created here by the Dominion Iron and Steel Company taking options upon some manganese deposits on the south side of Conception Bay, and for a time a great boom was expected. Manganese ore of low grade was known to exist in this locality for a number of years, but all attempts to secure a sale for the properties had proved unsuccessful. The ore was considered of too low a grade, though some of it yielded over 50 per cent. oxide of manganese. That the deposit is an extensive one has been clearly proven, as it has now been traced almost continuously for several miles along the coast, where the Lower Cambrian series rests unconformably upon the Older Huronian. The ore is confined to the Cambrian strip, and is a stratified deposit, somewhat similar in character to the Bell Island iron deposit, which is only a few miles distant, and in the same series of rocks, though at a higher horizon. It would seem as if so extensive and easily wrought a deposit, so admirably situated for shipment to market, can scarcely fail ere long to attract capital to its development. Manganese is known to occur elsewhere in the same series, but so far no high-grade ores have been met with.

Antimony and zinc ores occur in several localities, and one deposit of the former has been mined to a certain extent, at a place called Morton's Harbor, on an island in Notre Dame Bay. A special examination of this property was made by myself in 1898, which convinced me that here a most promising mine was awaiting development. In 1890-91, ore to the value of $2,200 00 was sent to market, but owing, I presume, to want of capital, the proprietors of the mine ceased working it. The ore was chiefly high-grade, ranging as high as 80 per cent. metallic antimony, and the situation of the mine is an ideal one in every respect.

Though gold is known to exist both in the free state and in combination with the baser metals, so far, Newfoundland cannot be said to have a paying gold mine in operation. This may be accounted for by the fact that but little actual prospecting for gold, by experienced persons, has as yet taken place, and also from the usual unbelief in its existence that prevails. Yet most of the low grade copper ores contain traces of the precious metal, and in the case of the Tilt Cove ores, an appreciable amount is annually recovered at the smelting works of the Cape Copper Co., in England. The returns given in the Mineral Statistics reports show an amount of 13,783 ozs. fine gold recovered during the past five years, or an average of 2,756 ozs. 12 dwts. per year. At Brigus in Conception Bay, some years ago, several handsome nuggets were obtained in small gash veins of quartz, cutting Huronian strata, and at Ming's Bight north of Cape John, on the N.E. coast, free gold was struck in sinking on a copper lode. It has been met with sparingly in the neighborhood of St. John's and near Cape Broyle on the Eastern sea-board, also in Huronian series. What, however, appears to hold out most promise is a recent discovery on the southern part of the island, near Rose Blanche and Garia Bays, amongst mica-schists and granites of Laurentian age (?) Immense bodies of quartz, or quartzose rock, sometimes over one hundred feet wide, and situated on the shoreline, have given mill tests of varying richness, though as a rule low, not averaging more than about 3 to 4 dwts. per ton. The ore is reported to be free milling, not mixed with pyrites, and can be easily and cheaply mined, with ample water power for crushing, while labour in the locality is cheap, The properties are looked upon by some of your Nova Scotian gold miners as offering exceptionally favorable prospects. One of those properties has recently been sold for $30,000, and other proprietors are awaiting favorable offers to dispose of theirs.

Another large body of quartz and ferruginous gossan occurs in White Bay, carrying galena and iron pyrites, which has also yielded an average of about 4 dwts. gold per ton.

While I recognize the fact that gold in sight and in paying quantities is the best and surest indication of auriferous deposits, I cannot conceive otherwise than in view of the above facts, and of the geological conditions pertaining to a great portion of this island, that a very few years will witness gold mining as an established industry here. It will, indeed, be remarkable should such not prove to be the case.

Amongst the non-metallic substances which have as yet attained any prominence in our mining industries, slate stands first. Roofing slate of the very best quality occurs amongst the lower Cambrian serles, in Trinity and Placentia Bays, on the East Coast, and in Humber Sound, Bay of Islands, on the West. For many years a quarry was worked in a small way in Smith's Sound, Trinity Bay, but only on a scale sufficient to supply the very limited local demand. Two years ago, Professor Walcott, of the U.S. Geological Survey, while on a fossil hunt, in which I accompanied him, visited the quarry, and was so impressed with the quality of the material and favorable conditions for working it, that upon his return home, he interested some American slate men in the matter, with the result that they sent an expert to examine the quarry, and purchased it out from the original owners. Last year the new company commenced operations, and shipped one small cargo of 600 tons to the English market, where it found ready sale, and was pronounced fully equal, if not superior, to the best Welsh slate. It is of a dark purple colour, and cleaves with ease into any thickness desired. There is also, in the same quarry, a smaller proportion of an unfading light green colour. which is much prized. One of the employees of the company informed me a short time since, that there is nothing in the way of roofing slate surpassing this quarry in

North America. It forms a cliff immediately on the seashore, rising some 500 or 600 feet above sea level. It strikes back into the land an unknown distance, and there is sufficient material in sight to last for generations. Nothing could surpass the facilities for shipping: the Sound is a long, deep, narrow, smooth water inlet, and any sized vessel can lay alongside the wharf, within a stone's throw of the quarry. Under the new management, with ample capital, experience and enterprise, this slate is destined to cut a figure in the English markets ere long. Great preparations have been made during the past winter for extensive work, and a large output may be looked for.

Though the country possesses an immense amount of building and ornamental material, most of which is on the immediate coastline, either at or in close proximity to the finest harbors in the world, nothing has been done with these as yet, except in a very small way. Beautiful granites, syenite, &c., exist in abundance and in great variety of color and texture, at most convenient points for shipment. During the construction of the Railway, a considerable amount of such rock was quarried and used for bridge abutments, and other structures calling for stone work. At the present time, a small quarry of pinkish syenite is being operated at a place called Petites, and the material is used in the construction of a new court house at St. John's. The rock is admirably adapted for structural purposes, and will present a most imposing appearance. The quarry is right at the water's edge, and the natural cleavage of the rock is such as to afford every facility for working and dressing into slabs or blocks of any desired dimensions or thickness.

There are immense deposits of marble along the western and northern parts of the island, but beyond obtaining specimens for exhibition or ornament no attempt to establish marble quarries has been made.

Serpentines of great beauty are quite common to the localities where these metamorphosed deposits occur, and many varieties of porphyries, jaspars or other ornamental stones are abundant.

Specimens of most of the above, cut and polished, are in our local museum, and are much admired by visitors.

So far, we have not been successful in exploiting our asbestos or gypsum deposits, though both exist in abundance. The former is usually of short fibre, yet some has been obtained four to five inches long, but no systematic attempt has been made to develop this material, and it will have to be better known and advertised before we can expect such. The gypsum occurs in vast bodies amongst the lower carboniferous series in Bay St. George district, and much of it is of the snowy white variety, well adapted for paper filling, &c. This, also, is awaiting capital to develop it.

Many useful substances, which have not been mentioned, are known to occur, but the time is not yet ripe for exploiting them. New finds are constantly being made, and minerals heretofore regarded as worthless are coming to light, such as molybdenite, rutile, barite, graphite, salt or saline springs, steatite, soapstone, agalmatolite, asphaltum, anthraxolite, garnet, feldspar, kaolin and brick clays, fire clays, terra cotta clays, moulding sand, fluor spar, quartz and rock crystal, amethyst, tourmaline, lithographic stone, limestone, mica, especially on the Labrador coast, red and yellow ochres, &c.

Though neither apatite nor corundum have as yet been met with, there is reason to believe they both exist in the country, and for that matter, there are few mineral substances common to the older rock formations of the earth's crust, which may not reasonably be looked for.

In this review of the history of mining industry in the colony, I have endeavored to show the slow but steady growth of the industry, and the tremendous up hill work it had to contend with all through. Less than half a century ago Newfoundland was a thoroughly unknown and unexplored country, with no resource but one—the fishery. Her population consisted of fishermen, merchants, a few mechanics and professional men: her whole existence depended upon the precarious and fluctuating sea-harvest. In times of failure of the latter, the bulk of her population were thrown into poverty aud abject misery. The opening up of the country by railways and coastal steam service has given an impetus to lumbering, agriculture and mining industries, which are rapidly forging ahead, and another decade or two will witness an extraordinary advance in these directions. I anticipate that the periods of depression, consequent upon her single industry, though not yet removed from the realms of possibility, will soon become at least minimized to a great degree. With wise government and advanced ideas, these periods of wholesale depression should not have such far reaching effects in the future. For, I do not hesitate in saying that judging from all the circumstances, the country's mineral wealth alone is capable of sustaining many times her present population, and the day will arrive when the fishery, grand resource as it is, will have to take second place in her economic and industrial pursuits.

Within the past five years the value of the mineral products has increased from one to four millions of dollars, while that of the fisheries remains almost stationary, at about eight millions of dollars.

Some one has described Newfoundland as "a country of grand possibilities." Your readers will, no doubt, be inclined to the same opinion after a perusal of this paper, yet there is more truth than poetry in that saying, and optimist as I am termed, yet I have seen many of my predictions fulfilled, and hope still to see many more.

Should the development of our coal areas be brought about, in the near future, it will result in a boom for the Ancient Colony such as few dream of at present.

JAMES P. HOWLEY.

The Operation of the "Hole-Contract" System in the Center Star and War Eagle Mines, Rossland, B.C.

By CARL R. DAVIS, E.M., Rossland, B.C.*

I. GENERAL REMARKS.

The cost of mining during the past history of these mines has been excessive, principally by reason of the inefficiency of labor under the wage-system. The amount of labor performed per man was unsatisfactory; and Mr. Edmund B. Kirby, the general manager, decided to adopt the contract system as a remedy. For this purpose the method now in use was devised by the writer (then and now the superintendent), as best adapted to the local conditions. On March 12, 1900, this system was presented to the miners of the War Eagle and the Center Star. The issue remained unsettled for several weeks, during which the mines were closed. On April 5 an amicable understanding was reached, and the miners resumed work on the new terms. The system was introduced by degrees; and the results of a year's trial have shown it to be an unqualified success.

The veins of this district have been formed by replacement in fissures of the shear-zone type, ranging in width from several feet to 100 feet, or more, and fairly regular in strike and dip, through the main mass of Red Mountain, which consists of augite-diorite, a dark, tough, basic, eruptive rock.

Between the limiting walls, the vein material ranges from a hard silicified mass, with only scattering mineralization, to an almost solid sulphide, mainly pyrrhotite, with a relatively small amount of chalcopyrite and pyrite. Consequently the rate at which drilling proceeds varies considerably within short distances; but the *monthly* average of the

*Paper read before the American Institute of Mining Engineers.

MINING IN NEWFOUNDLAND.

PYRITES MINING AT TILT COVE.

7—View from East Side Incline. West Mine in centre. Offices, stores, etc., to the left. 8—View from East Side Incline, North end of Pond showing miners' houses, etc. 9—View from West Mine Bluff, towards East Side Incline. 10—West Mine Bluff, showing Cove and Wharfs. 12—Cove from outer point. S.S. "Annandale" loading.

Open Cast Workings in the famous Red Hematite deposits of Bell Island, Newfoundland.

MINING IN NEWFOUNDLAND.

PYRITES MINING AT TILT COVE.

1—Looking towards East Mine from the pond. 3—East Mine Pumping Station. 4—Showing surface over East Mine. 5—View showing entrance of Cove from head of pond. 6—View showing head of Winsor Pond. 11—S.S. "Para" loading ore.

Tilt Cove Copper Co., Tilt Cove, Newfoundland.

MINING IN NEWFOUNDLAND.

Steam Shovel at work on the Wabana Iron Mine, Bell Island, Newfoundland.

Mining Red Hematite at Bell Island.

MINING IN NEWFOUNDLAND.

Open Cut on seam about 18 feet thick worked by Dominion Iron and Steel Co. at Bell Island, Newfoundland.

Drills at work on the Red Hematite deposits of Bell Island, Newfoundland.

MINING IN NEWFOUNDLAND.

Steam Shovel at work on the Wabana iron mines of the Nova Scotia Steel and Coal Co.

Pilley's Island Pyrites Mine, Notre Dame Bay, Newfoundland.

MINING IN NEWFOUNDLAND.

Outcrop of Iron Ore band, Bell I-land.

Wilton Grove Slate Quarry, Snider Sound, Trinity Bay, Newfoundland.

MINING IN NEWFOUNDLAND.

Granite Quarry, Benton, near Gander Lake, Newfoundland.

Diamond drilling for Coal near Grand Lake, Newfoundland.

MINING IN NEWFOUNDLAND.

Pilley's Island Pyrites Mine, Notre Dame Bay, Newfoundland.

Drilling Rig for Petroleum at Parson's Pond,
West Coast Newfoundland.

Derrick Drilling for Petroleum at St. Paul's,
West Coast Newfoundland.

MINING IN NEWFOUNDLAND.

Outcrop of Coal Seam, Aldery Brook, Grand Lake, Newfoundland.

Drilling for Coal near Grand Lake, Newfoundland.

MINING IN NEWFOUNDLAND.

Mining Iron Ore on the property of the Nova Scotia Steel and Coal Co., Bell Island, Newfoundland.

number of feet drilled per machine per shift does not vary more than 5 per cent.; thus allowing an accurate determination of the price to be paid per foot of drilling.

Generally speaking, the vein-material and the surrounding country-rock are very hard and tough, making it unnecessary to timber the headings. In fact, stopes up to 50 ft. in width can be made without timbering. Another feature bearing upon this problem is the complication of the geological structure by numerous dykes and faults. The pay-shoots are very irregular in outline, so much so that the payment of contractors in the stopes by the fathom or any other unit would be impossible, by reason of the difficulty of measuring exactly the volume of rock broken during a given period. The determination of the amount of ore stoped by making a mine-car the unit of measurement for either weight or volume was considered, but had to be abandoned on account of the impracticability of keeping the ore broken by each set of contractors separate, since, at times, the ore broken by several sets of contractors is drawn off through the same loading-chute in the mine.

II. CONTRACT SYSTEMS.

Two methods are employed in measuring the amount of work performed:

1. Measurement of the number of linear feet of advance. This method, commonly employed in all parts of the world, is applicable to headings only, such as drifts, cross-cutss, raises, winzes, and shaft-sinking. In these mines, where payment is made per running foot, the contractors are charged for the explosives, which are furnished to them by the company at cost. This results in greater economy in the use of explosives than is secured by the practice, followed in some western mines, of supplying powder, etc., free. Under such an arrangement the men are not as careful as they would otherwise be to put their holes in the most advantageous positions; and, substituting powder (which costs them nothing) for labor, they make the total cost of the work unnecessarily large. In raises and winzes, the necessary timbering is performed by the company; but in shaft-sinking the contractors place the sets in position, subject to the approval of the mine-foreman. Blasting is done by the contractors at any time.

2. Measurement of the number of feet of holes drilled. This system, first adopted for use in the stopes, has been shown by experience to possess several advantages over the one above described; so that, in many cases, it is now used even in drifting and cross-cutting, and deserves to be here more fully described.

III. DETAILS OF THE HOLE SYSTEM.

The underground work is carried on by two 8-hour shifts, arranged as follows: morning shift, 7 a.m. to 4 p.m, with an interval of one hour for dinner; afternoon shift, 4 p.m. to 1 a.m., with one hour for supper. The men are raised from and lowered into the mine on their own time, (*i.e.*, before and after the terminal times given), making eight hours the actual working time. In shaft-sinking and in occasional headings, three shifts are employed, and the work is carried on continuously during the 24 hours. With the exception of the main shaft, in which the contract includes 12 men, contracts are generally let to four men, working in pairs for two 8-hour shifts daily. Contracts are verbal, not written. No sub-contracting is permitted, and the men share equally in the profits of each contract. In case of sickness a contractor must provide a substitute. If any contractor wishes to leave before the expiration of the contract, he is paid his share of the net earnings according to his proportion of the total number of shifts worked. Prices are fixed and contracts are let at the beginning of each month.

On beginning work, each set of contractors is supplied with a tool-chest, provided with lock and key, containing all necessary tools and

supplies for machines, for which a receipt is taken. At the expiration of the contract the tools are inventoried, and those missing are charged to the contractors. On the other hand there is no charge for breakage, if the broken tools are turned in, and new ones are issued. Machine-drill repairs are made by the company; but it is understood that breakage through neglect or carelessness is sufficient cause for discharge. When desired, a box for steel drills is placed at some convenient point on the level. This box has two compartments: one for sharp steel, placed therein by the tool-packer; the other for dull steel, which the tool-packer collects while replenishing the "sharps."

The first duty of the miners on the morning shift is to pick down the loose ground left from the blasting. When the "back" has been made secure, the machines are set up, and drilling proceeds continuously during the two 8-hour shifts. The location of the holes to be drilled is marked, and their approximate depth and direction are indicated by the foreman. Misplaced holes, or those drilled too deep, are not accepted by the foreman as entitled to be paid for; and an occasional check of this kind is all that is necessary to insure good work. Drilling proceeds without interruption during working hours, and is only stopped on the night-shift in time to allow the contractors to take down the machines, clean out the holes, and leave them in shape for the blasting crew, before leaving the working-faces at 1 a.m. The number of feet of holes drilled is measured at the end of the shift, at which time a record of the measurement is furnished to the contractors, and a duplicate is delivered at the office.

The blasting-crew works between the hours of 1 a.m. and 7 a m, and its work consists in loading and blasting the holes drilled by the miners. This effects a considerable saving in the consumption of explosives, since these are handled by a few picked men only. Another advantage of this method is that it involves no loss of time by miners and muckers (shovellers) in waiting for the working faces to become clear of smoke.

In headings, the details of the work are, in all essentials, the same as previously explained with respect to the stopes. The number, direction and depth of the holes are outlined by the foreman or shift-boss; but when contractors have become familiar with the ground, little direction of this kind is needed, the work being practically the same each day. The working hours are the same as in the stopes. On entering the heading in the morning, the miners pick down the roof, put up the horizontal bar supporting the machine-drill, and proceed with the drilling of the holes in the upper part of the face. While drilling is carried on, the shovelers are removing the broken rock from the previous blast. By the time this has been cleared away, the machine men are ready to take down the bar, set it again in a horizontal position near the floor of the drift, and drill bottom-holes or "lifters." These being finished, the machine is taken down; the holes are cleaned out; and a floor is laid for the shovelers. Everything is then ready for the blasting, which, as in other parts of the mine, is performed between 1 and 7 a.m. by a special crew.

In headings where a certain number of holes have to be drilled before the whole set or "round" can be blasted, the difficulty with the "hole system" (*i.e.*, the system of payment according to linear feet of aggregate drilling) is in making sure that the contractors finish this work before blasting-time, in order that they may not have to lose working-time during the blasting, and thus that they may be kept continuously employed. This difficulty is met, either (*a*) by increasing or decreasing the depth of the holes to be drilled; or (*b*) by having one or two spare headings or stoping-breasts in which contractors can utilize their extra time. The latter expedient is to be preferred, for the reason that, to secure the best effect, the depth of drill-holes ought to be determined on other grounds than that of the time required to drill them.

Advantages of the Hole System.

1. Its applicability in stoping, where the ore-shoots are irregular in outline, and measurement by weight or volume of the ore broken cannot be easily made.

2. Within certain limits, the number of machines in any one stope can be varied at will; and there is no difficulty such as would arise from the necessity of keeping separate the work done by each set of contractors.

3. The system is extremely elastic; that is, the same set of contractors can be employed in different headings or stopes, without any resultant confusion in measuring the work performed.

4. Blasting is done only in the interval between 1 a m. and 7 a.m., and the miners and shovelers are not kept idle, waiting for the smoke and gas to be cleared away from the working-faces.

Disadvantages of the Hole System.

As above shown, this system has been perfectly satisfactory in stopes. In headings, the disadvantages, as compared with the linear system of payment per running foot, are as follows:

1. Two 8-hour shifts only are employed under the hole system; while by the system of paying according to the linear progress of the heading, three shifts may be employed daily, and blasting done at any time, thus often increasing the rate of advance, which may be a matter of supreme importance in opening new ground, etc.

2. The difficulty, already discussed, of so laying out the work that the round of holes may be completed in the two daily shifts, without an undue loss of time to the contractors.

IV. ECONOMIC RESULTS OF THE HOLE-CONTRACT SYSTEM.

The following tables show the saving effected by the substitution of the contract- for the wage-system. In this connection I may add that the advantage thus gained by the employer is not lost to the workmen. The miner now receives daily from $4 to $4.25, as against $3.50 under the wage-system.

Table I.—Comparative Cost of Stoping.

	Contract (Hole-) System. Per ton.*	Wage-System. Per ton.†
Drilling	$0.356	$0.750
Blasting	0.021	
Explosives	0.100	0.115
Total	$0.477	$0.865

Table II.—Comparative Cost of Development-Work.

	Contract (Hole)- System. Per foot.‡	Wage-System- Per foot.§
Drilling	$5.36	$8.36
Blasting	0.68	
Explosives	2.75	2.78
Total	$8.79	$11.14

Equally important with the saving, per foot or ton, shown in Tables I. and II. is the increased speed with which shafts have been sunk, and headings have been driven. For it is clear that, other conditions remaining the same, the output of the mines is governed by the time required to open new ground in depth by sinking and driving levels, etc. In drifting and cross-cutting, the average rate of advance per month has been increased from 50.8 feet under the wage-system to 97.5 feet under the contract system; this comparison being made on the basis of two shifts (4 men) per day, and a 30-day month. In shaft-sinking, calculating on a basis of three shifts (12 men) per day, and a 30-day month, 555.5 feet of work done under the contract system, compared with the last 200 feet done under the wage system, show the rate of advance per month to have increased from 27.2 feet to the present average of 58 feet.

* Calculated from 49,849 tons of ore stoped.

† Calculated from 13,818 tons of ore stoped.

‡ Calculated from 1,244 feet of headings driven.

§ Calculated from 1,377.5 feet of headings driven.

COMPANY NOTES.

Nova Scotia Steel and Coal.—In a letter from Mr. R. E. Chambers, M.E., Engineer in charge of the Company's iron mines in Newfoundland, he reports as follows:—This season we have mined 212,000 tons and shipped 45 steamer loads amounting to 201,000 tons Our biggest month was July with 66,000 and the biggest days run 3,708 tons. There have however been loaded on steamers from bins three cargoes amounting to 16,000 tons in a day. The underground work is fairly commenced and analysis of core from borehole at extreme limit of the property shows the ore to be of first rate qualilty.

Consolidated Cariboo.—Reports from this mine indicate a likelihood that the wash-ups for the present season will probably fall short of anticipation, work having been greatly hindered by a heavy fall of rock. The output will probably be between $250,000 and $300,000.

Forty-Third M. & M. Co.—In a circular to the shareholders under date of 4th September, Mr. N. C. Sparks, President of the company reports:—"With Mr. G. C. Martin, of Tweed, one of our largest shareholders, I left Ottawa June 22nd and arrived at Manson Creek July 20th. We spent four weeks there, leaving August 18th for home. The company's property was found to be in excellent condition; the additions made last year to the plant being fully up to the standard of that previously reported upon. During our stay actual mining was not in progress, nearly the whole force of men being engaged in the work of changing the elevator plant to Slate Creek and in the erection of the new pipe line on Mauson Creek. Colonel Wright turned the water on to the elevator in Kildare Gulch as soon as the snow and frost were out of the pit. For some time the ground proved favorable and the greatly increased capacity of the elevator, due to the larger throat and improved method of feeding, gave hopes of a large clean up there. Unfortunately the run of gold thinned out and after some attempts to re-locate the heavy run, the change to Slate Creek was decided upon. The run is known to exist farther up the Gulch, but as Slate Creek has always been the objective point of the Company's work, it was decided to move there at once. After the penstock was built, the elevator was temporarily set, and with the aid of its suction pipes, test pits (one 163 feet distant) were sunk in order to obtain some knowledge of the creek bottom and to find the best position in which to place the elevator permanently. It may be as well to explain that while much work has been done on the sides of this creek by old timers, who went as deep as they could, it has never been before bottomed. The gravel is deep and there is very little fall to the creek, so that they could only follow the bed rock down a short distance on either side. The existence of a great number of shafts gave an indication of the high values found. Before we left four pits were sunk and gravel 16 feet deep disclosed on one side of the creek. Sixty yards gave a return of fifty dollars, one-third being picked up by hand by the men shovelling in the pit, the balance being caught rather unexpectedly in a short line (3 lengths) of sluice boxes put up mainly to dispose of the water and gravel tailing from the elevator. The amount saved cannot be over 50 per cent. of the gold contents, and some estimates make it 25 per cent. The gravel in the last three pits was large and tight, and progress in their confined limits was slow until the derrick was put to work to handle the boulders. The last pit was being enlarged and more sluice boxes were added before we left, so that with more room to work greater progress would be made and at the same time the gold values would be saved. If there was no decided change in the position of bed rock the elevator would be put down into this pit as soon as it was sufficiently opened. The benches just along side and about 100 yards up stream have given big prospects, one yielding one four and one six ounce nugget. While the pits were being sunk the Chinese miners were employed clearing the brush from the creek bottom as far up as Poverty Bar, and the old workings can be more clearly seen. Several miners who worked on the creek in early days gave the names of owners and details of gold recovered from various claims. They were unanimous in their opinions as to the great richness of this part of your property. There is a mile or more where every claim was partly worked and each returned an ounce or more per man per day. Some photographs taken of this part of the creek will give a slight idea of the work done there. A penstock was erected on the front of claim 22, Manson Creek, and a pipe line and No. 2 Monitor installed to work the bench of the Arctic Slope Co., as per contract. The pipe for this plant did not arrive until rather late, but no time was lost in riveting and laying it. The ground to be worked is just opposite Discovery Bar and prospects well. It is expected that 1,000 yards per 24 hours will be turned over by 10 men. This plant would begin opening up the face of the bench August 19th. Mr. M. W. Loveridge being on the ground, a full report on the property was obtained from him and is presented herewith. Colonel Wright is indefatigable in laboring in the interests of the Company and maintains his staff in a high state of efficiency, but the work has now reached a stage where he requires the assistance of an hydraulic engineer, and one should be secured for next season. The change to Slate Creek would have been begun sooner but Col. Wright expected I would arrive at the mine at an earlier date than I found possible, and he wished to consult as to the point to be worked there. It is to be regretted that owing to the difficulties which have delayed the completion of the last few miles of the Yukon telegraph main line, the branch into Manson may not be begun this year. Supplies have been at Stuarts Lake all summer, and the appropriation voted, but the men are all engaged on the main line A railroad from Kitmat Arm to Hazelton is being surveyed, which, if constructed, will reduce our freight rates and transportation difficulties very greatly. There was a good supply of water in the creek. and it is probable that both plants are working full time now. I am more fully convinced of the great value of your property, and believe that when it is opened up it will be one of the big producers of British Columbia."

Ymir Gold.—A Rossland correspondent writes: The news that a bonanza ore-body has been discovered in the Ymir mine will be a crumb of comfort to the ill-starred participators in the British Columbia market. The average value of the ore milled by the Ymir is $8.88 per ton, and satisfactory profits are earned on that. What a chute of ore 26 ft. wide and containing nearly five times the value means to the dividend-earning capacity of the mine may be imagined. In discussing the strike, the manager, Mr. Robertson said that in running the No. 4 level the ore-body carrying the values indicated had been encountered to the west of the dyke. No. 4 drift is the lowest level so far worked, but the shaft is down some 600 ft, and in ore. Mr. Robertson explained that this dyke had been met regularly on all the upper levels, and before being met on the No. 4 the ledge carried good values, and when the dyke was cut the ore-body widened out to the 26 ft. above mentioned. The ore-body continues to appear well as the work on it progresses. To sample it mine-car samples were taken across 15 ft. of the ledge at a time when the entire width had not been ascertained, and these gave values of $35 00 in gold and $5.00 in silver to the short ton of 2,000 lb. Mr. Robertson said he was naturally pleased with the find, and if the favorable appearance of the ore chute continued it would naturally mean a very considerable increase in the earnings of the Ymir Company, as the average value of the Ymir ore milled last year was returned at $8.88. Viewed in this light the find was sensational, and it gave him great satisfaction to report it to his directors, as there was every indication that the new body contained greater average values than any previously encountered in the Ymir mine. Naturally he would like to see the ore-body in the No. 4 level reach the expectations of the most sanguine; anyhow there is no occasion for uneasiness so far as the Ymir property is concerned. The company's mill is now grinding out 200 tons of rock per day, and there is ore enough blocked out in the mine to keep the mill running at this rate for over two years. Mr. Robertson said he was confident that the reserves above the No. 4 level at the present moment represented a two year's supply, and he had not the least doubt but that there was ore enough in sight to keep the mill going for three years; but two years' reserve in sight was not bad, and before it was used up something might be heard from the long tunnel which is now being run in to catch the Ymir lead at a depth of 1,000 ft., and in view of the large amount of other development work which was being steadily pushed along. To get the ledge at this depth it will be necessary to run almost 2 ft. for one, which means a pretty long tunnel. It is now in about half the distance, and rapid progress is being made upon it.

Bosun Mines, Limited.—The Secretary, under date of 3rd instant, reports:—"The following telegram has just been received from the mine manager, Mr. W. H. Sandiford: 'Shipment for August amounts to 20 tons galena. Mine looking up all round, in the bottom of winze (from) level No. 2 the width of the pay-streak is 2 ft. 6 in. Level No. 3, 10 in.' The above shipment of 20 tons is ore that has been obtained during development and without stoping. The directors consider that the above advices indicate that the development operations have been of a satisfactory nature. It is now under consideration as to shortly recommencing shipments.

Baltimore Nova Scotia Mining Co.—This company, operating the Lake Lode gold property at Caribou, N.S., is receiving bids on a 40-stamp battery.

Vindicator Gold Mining Co.—This company has been formed in Nova Scotia to acquire and work the Drysdale gold areas at Goldenville, N.S. The capital stock is $50,000, in 50,000 shares of a par value of $1 each. Among the directors are C. D. Pickles, of Annapolis, N.S; George A. Pickles, M.D., of Mahone Bay, N. S.; F. W. Green, Halifax; and Chas. A. McClair, of the Blackhouse Gold Mining Co.

Dolliver Mountain M. & M. Co.—This Nova Scotia company has called for tenders for the construction of a 50-stamp battery on their gold property at Isaac's Harbor.

Athabasca Gold Mine, Ltd.—At an extraordinary general meeting of this company held in London on 14th ultimo, the following resolution was proposed:—"That the company be wound up voluntarily, it having been proved to the shareholders' satisfaction that the company cannot, by reason of its liabilities, continue its business, and that it is advisable to wind up the same, and Mr. John A. R. Clark be and is hereby appointed liquidator for the purpose of such winding up, at a fee of 50 guineas." The Secretary of the company remarks that the shareholders are probably aware that lack of water in the early part of the year, and the consequent inability to work the air-compressor plant and rock drills, caused the development of the mine to fall greatly into arrears, to such an extent that it was necessary from lack of ore to close down the mill and simply keep a small force of men on development work and the cyanide process. The cyanide plant works with great success, and, as the mill was closed, the $5,872 yield of gold for June was obtained entirely from the cyanide. Unfortunately the amount of tailings on hand cannot keep the cyanide plant supplied for more than a few weeks. Under the circumstances it was deemed best by the directors to confer with the manager. He came to England in May and explained the position of affairs, and that a considerable overdraft had been necessary from our bankers at Nelson to meet the losses on working during the past five months. The directors then decided that before proposing anything to the English shareholders, it would be well to get the opinion of the Canadian shareholders, who hold more than half the shares in the company. The manager has now been in Toronto for some days discussing a plan whereby the company may be greatly strengthened by amalgamating with an adjacent property which is in a highly developed state, with large bodies of ore ready for stoping and practically ready to commence shipping to the Athabasca mill. The Canadian shareholders have entire confidence in the mine. The following letter from a Canadian firm in Toronto, representing the Canadian shareholders, dated July 12, gives the latest information in the possession of the board: "We had been waiting to answer your letter of the 14th of June until we had seen Nelson Fell, who arrived here last Monday, the 8th July, and since then we have been in close communication with him and other parties interested in the Athabasca and the Venus as to some way of getting out of the present difficulty, and we are very hopeful that in the course of the next week or ten days we will be able to forward you a scheme of reconstruction that will meet with your approval and that will be of great advantage to the property. Just as soon as we can get things in shape and can make some definite proposal we will at once communicate with you, either

by cable or letter." In the last paragraph of his circular the secretary of the Athabasca company says the directors hope to lay the scheme referred to before their shareholders very shortly; but in the meantime consider it best for the interests of all concerned, to put the company into voluntary liquidation.

Rambler-Cariboo Mines, Ltd.—At the annual general meeting of the Rambler-Cariboo Mines, Limited, held in Kaslo, a dividend of one per cent. was declared. The dividend was payable on Aug. 30th, and will be the first of a series of bi-monthly dividends which are to be distributed until further notice. The election of officers resulted in the return of last year's officers and board as follows:—A. F McClaine, Tacoma, president; J. J. Humphrey, Colfax, vice-president; William Hastie Adams, secretary-treasurer and general manager; directors, Jas. D. Chapliu, St. Catharines, Ont.; A. F. McClaine, Tacoma; Alfred Coolidge, Colfax, Wash.; Chas. J. Kapps, Kaslo, B.C.; J. J. Humphrey, Spokane, Wash.; Bernard MacDonald; Wm. Hastie Adams, Kaslo. The following circular has been sent out to the stockholders with the notice of dividend No. 5: "Your directors concluded this day a thorough examination of the properties of the company, and feel amply assured in congratulating the stockholders upon the present conditions of 'mines and treasury.' The improvements in the ore chutes, both in quantity and grade, have been marked from level No. 1 to Nos. 2, 3, and 4, respectively, and in the case of the lowest level, No. 5, the gain has been nothing short of phenomenal. The monthly products and profits permit us to enclose notice of dividend No. 5, and we anticipate similar distributions to shareholders every 60 days, notwithstanding that at this time we are installing additional mine equipment to the extent of $35,000 to $40,000, consistiug of 2,500 ft. flume and pipe line, 400 light electric plant, 60-ton concentrating mill, belt-driven air compressor and 4-ton hoist. These improvements should be in operation Nov. 15th, and will double the earnings of the property. The policy of generous mine development and equipment will be diligently followed the coming year."

Tyee Copper.—The ordinary general meeting of this company took place last month. Mr. T. H. Wilson (the chairman), in moving the adoption of the report, gave some particulars regarding his visit to the mine in May last. At present work was only being carried on upon the Tyee claim, out of the 90½ acres owned by the company. The miners were a carefully selected body of men, and impressed him favorably. Water rights had been acquired, and a dam constructed. He took several samples from the workings which had been assayed by Mr. F. Claudet, with the following results:—Copper, 23.60 per cent.; silver, 7 ozs. 18 dwts.; and gold 2½ dwts. per ton of 2 240 lbs. He supported the scheme for increasing the area of the property, as he was of opinion that the valuable lodes possessed by the company passed through the claims proposed to be ecquired at a low price. They would also be able to erect electric machinery, deriving the necessary power from the Chemainus river, flowing through one of these claims, by which much of the work could be carried out more economically, and the low-grade schists concentrated on the spot. He congratulated the shareholders on possessing such a valuable property, and felt sure that when supplied with the capital required, they might look forward to a prosperous career, having arrived at the stage when more capital would produce early dividends. The report was seconded by Mr. E. B. Livingston, and unanimously agreed to. A resolution was also passed, increasing the capital of the company to £180,000, by the creation of 60,000 new shares of £1 each. The chairman added that the capital now proposed was small compared with that of most companies at the present time, bearing in mind the large area, which would be 240 acres, the whole of which they believed to be ore-bearing. Out of the £180,000 no less than £80,000 would be actual working capital.

Dominion Iron and Steel—A. J. Moxham, general manager Dominion Iron and Steel Co., in a recent interview, said the company's two furnaces are now turning out 450 to 500 tons of pig iron, all of which, except a low phosphorous iron needed for a special trade, is made entirely of Wabana ore. He added, "We will continue using foreign ore so long as we cater to this special trade, but it will be a very small portion of the whole. If we marketed all our product as pig iron the phosphorous iron would be 40,000 tons a year, against 400,000 of straight Wabana iron. The English trade is exclusively Wabana ore. We have had to curtail sales pending the blowing-in of numbers three and four blast furnaces, and these will probably be blown in within the next thirty to sixty days. Canada is taking now one-third and England two-thirds of the mill's products. We will be making steel somewhere between October and January. The rail mill will be probably finished in the summer or early fall of next year."

Westmoreland Copper Company.—This company is about ready to begin turning out copper at its works, 3 miles from Dorchester. Some difficulty has been experienced in getting deliveries of the necessary machinery, but at present the reduction plant, including steam apparatus, dynamos, furnaces and crushers, is nearly complete. Work is being pushed on the construction of the precipitating tanks, of which there will be about 80. The mine is opened up by three shafts—No. 1, on the northern side, being 135 ft. deep, and Nos. 2 and 3, on the southern side, 40 and 60 ft. respectively. The horizontal workings aggregate about 7,000 ft. in length. Since the present company took hold of the concern, somewhat over two years ago, they have spent about $240,000 at the works and mines.

British Columbia Copper Company.—This company's Mother Lode mine shipped during August to its smelter at Greenwood 7,245 tons of ore. The blast furnace needed repairs after a continuous run of 6 months, necessitating a shut-down of 8 days, and no ore was shipped from the mine for 10 or 12 days. The mine is now worked on the pillar and stope system Much deadwork is completed and stopes are open at both the 200 and 300 levels—in all, a dozen. The output will increase as soon as the second furnace, already ordered from the Allis-Chalmers Company, is ready. The big quarry is producing from 150 to 200 tons of ore daily.

Granby Consolidated Mining, Smelting and Power Company—The Old Ironsides, Knob Hill and Victoria, during August sent to the Granby Smelter 20,218 tons of ore. The output will be larger from now on. Work on the foundations, buildings and other preliminary work preparatory to putting in two more furnaces, two copper converters and other additional plant is well advanced. The quantity of ore hitherto sent down from the mines will be required to keep the smelter going.

Dominion Copper Company.—After doing a lot of development work on its Brooklyn, Idaho and Rawhide claims, the company has reduced its working force and operations were suspended on the Idaho and Rawhide. More machinery is being installed on the Brooklyn, where more men have been put on.

Granite Gold Mines, Limited.—This company's properties were sold under an order of the Court recently, and were bought in by the liquidator of the Duncan Mines for about $134,000—the amount of the indebtedness of the Granite Company to the Duncan Mines. It is stated that the reconstruction of the Duncan Mines has been arranged in London, the new company to be known as the Duncan United Mines, Limited, with a capital of £300,000 in £1 shares. The new company, it is said, will first develop the Poorman mine, sinking 300 ft. below the present workings and doubling the output. E. R. Woakes is engineer in charge.

Molly Gibson.—Men are at work on this claim near Nelson, at the head Kookanee Creek, driving a cross-cut tunnel from the end of the tramway to tap the main lead below the present workings. The total distance will be 250 ft. The ore is galena carrying silver.

Montreal & Boston Copper Company.—This company during August shipped about 300 tons of ore to the Hall Mines Smelter at Nelson. A 14 x 20 double-cylinder double-drum hoist has been ordered from the Jenckes Machine Company, of Shebrooke, Que., for delivery in November. An electric light plant has also been ordered. Besides extending development underground in the Sunset Mine, the company is opening a quarry in ore on its adjoining Crown Silver claim. The managing director has announced the company's intention to build its own smelter. A short spur now connects the Sunset with the railway, and ore-bins are to be erected shortly.

Hall Mining and Smelting.—Sept. 13. Output of smelting ore from the Silver King for four-weekly period ending August 26th, 2,586 tons, averaging 21.62 ounces silver and 4.75 per cent. copper.

Tyee Copper.—September 9. Still cross-cutting splendid body of ore. At the present time we have 20 feet. Average assay of ore is, gold 4½ dwts. per ton; 4 ounces of silver per ton (of 2,000 lbs.); copper, 8 per cent. Selected ore assays, gold, 15 dwts. per ton; 7 ounces of silver per ton (of 2,000 lbs.); copper, 20 per cent.—Livingston.

Velvet (Rossland) Mine.—With reference to the recent rich strike in the main shaft, general manager cables September 10:—An average sample from 3 tons assays 1 ounce gold, 8 ounces silver, and 9½ per cent. copper (wet assay). Approximate value £10 per ton.

New Goldfields of British Columbia.—The following is excerpted from the fourth annual report, which has been issued to the shareholders this month:—The profit and loss account shows a gross profit of £7,604 8s. 6d., expenditure £6,111 1cs. 1d., leaving a net profit for the year of £1,492 18s. 5d. This balance, together with the amount brought forward from last account, viz., £8,590 13s. 8d., gives a total credit balance of £10,083 12s. 1d., from which has been paid dividends as declared, special remuneration to directors and income tax amounting to £7,842 13s. 10d., leaving a net credit balance at date of £2,240 18s. 3d. The unfavourable condition of the mining market referred to in last year's report has continued, and it has specially affected mining interests in British Columbia. Although your directors believe the depression to be only temporary, they have thought it prudent to considerably write down the value of all its mining securities, and, under the circumstances, do not propose the payment of a further dividend, beyond the interim dividend of 5 per cent. already paid, leaving the reserve of £5.000 shown in last year's balance-sheet and the balance of this year's profit, together amounting to £7,240 18s. 3d., to be carried forward.

VELVET (ROSSLAND) MINE, LIMITED.—It was thought desirable by the Directors of that company, in consequence of unsatisfactory progress at the mine and loss of confidence in the manager, to make a change in the management. Mr. Stanley Sorensen, a highly competent engineer, was appointed to take charge, and his report upon the property was issued to the shareholders of that company a few weeks since. Although the estimates given by Mr. James Morrish, late consulting engineer of that company, as to the quality and value of the ore in sight have not been confirmed by Mr. Sorensen in their entirety, the developments being now carried out under the direction of the new manager appear to be identical with those recommended by Mr. Morrish, and have, especially during the last month, given most reassuring results, thereby warranting, in the opinion of your directors, continued confidence in the value of this property.

PORTLAND (ROSSLAND) MINE, LIMITED.—Mr. Sorensen's latest report states that the result of the developments at the No 1 Shaft give "evidence that this part of your property is in the region of ore deposits of a payable, I might almost say, highly payable nature," and that this part of the mine should be equipped with suitable hoisting gear. At the same time he points out that the developments of the Velvet Mine are such that they are exploring the ground in juxtaposition to this part of the property.

Le Roi No. 2.—Shipments last week approximately 650 tons. Expect to have mine supplied with full force men within the next week, when shipments will soon rise normal.

Le Roi.—The manager cables:—"Smelter treated 10,500 tons of ore during month of August. Estimated value $150,000, matte shipped $130,000. We are now shipping 80 tons per day dump ore to the smelting works at Trail. Expect to have plenty of men within two weeks from this date to commence shipments from the mine."

Ymir.—The following cablegram has been received from the company's representative at Nelson, British Columbia:—"During last month 80 stamps ran 706 hours (29 days 10 hours). Estimated profit on operating is $26,600 (£5,480)."

MINING IN NEW BRUNSWICK.

Considerable interest along the mining route is noticeable—but we lack capital and judicious advertising of our mining chances, so the work goes on slowly but nevertheless surely.

The recent development by the N.B. Petroleum Company has resulted in oil being discovered in the Memramcook district, Westmoreland Co. near St. Joseph's Catholic College. Evidences of existence of oil has been long knowu iu this vicinity. On the strength of reports by Prof. Shaler of Harvard the Government of N.B. passed legislative enactments that were framed to develop this industry—though their action is a questiouable transaction as they conferred on the N.B. Petroleum Co. monopolistic powers giving them exclusive rights to have first choice on 10,000 square miles of territory in the province—before any other company can invest—the reason being given that capital could not be otherwise induced to go in. However this company have been exploring and working for past two years with result that the oil sands have been struck and two wells at no very great depth have shown oil in fair quantity and of a quality that is of the very highest grade. Other wells are now being put down and the hopes of the shareholders are very much above par at present time.

Within 4 miles, or so, operations have been quietly but vigorously going on on what is known as the Intercolonial Copper Co. The chief promoters of which are Providence, R I. capitalists. A large force of men have driven tunnels, sunk shafts and are now mining and storiug ore for crushing and smelting. A splendid outfit of machinery, engines, boilers, crushers, roasting plant, and smelters have been placed on the property and it is probable the expenditure has not been less than a quarter of a million dollars. The work of smelting will soon be commenced. Of this more full and explicit details at a later day.

Near St. Stephen, N.B. work of exploiting the large and well known deposits of pyrrhotite or nickel ore is being quietly pursued. The Government diamond drill I understand is in use at present. I have a number of times before referred to this deposit in the columns of the REVIEW. To many persons it looks as if some day it might be a respectable rival to the Sudbury nickel deposits as its proximity to the Atlantic sea board would be much in its favor.

Within 16 miles or so of Sussex, N.B. some capitalists from Nebraska have been exploiting a copper, gold and silver vein at a point known as Hillsdale, and the evidences are very favorable for a valuable mine at this point. The vein is well defined, laige, and the ore certainly is very prepossessing.

At a point in Kent County a short distance above Moncton, known as Mt. Carlyle, some New York capitalists under the direction of a Mr. Polley's, M E. are sinking a shaft, erecting buildings and propose to develop and mine coal which it is claimed exist in good working quantity there. Also to develop manganese claims controlled by same parties. The result will be anxiously looked for as there are many unbelievers. Nevertheless this company purpose seeing it through.

The sketch in the REVIEW of late issue of a New Brunswick coal mine—motive power a horse—is good. The feeling is however that coal exists in workable quantity and Mr. Poole's ideas may wake up some of the dormant ideas of our Government and home capital. The first step has been taken and the construction of the N.B. Coal & Ry. Company's road from Chipman, Queen Co. to Fredericton will determine matters as this Co. will be bound to open up certain coal measures and mine not less than 150,000 tons of coal per year in order to avail themselves of the Government grant voted for the purpose. The first section of the road, 15 miles, is now under contract—the remaining 30 will be built next summer.

Much prospecting is going on in a quiet way for copper, pyrites, manganese, graphite, baryta, iron, and last but not least gold which beyond doubt exists in N.B. The former metals are numerous and good showings can be pointed out easily if we only had the capital to develop them. Mispickel, galena and other sources of wealth are well known but it seems impossible to get capital to invest. Perhaps however our day will come.

Since writing the foregoing, *re* the Dorchester Copper Mine, a chance visit brought me to the locality and I took the trouble to look around a little. In company with a friend we met Mr. A. W. Chapman, the resident manager, and by him were shown over the works and buildings, and were astonished to see so much development. Two shafts, and the tunnel some 1,500 ft. into the hillside, are being worked regularly, and the ore piled up awaiting the starting up of the mill and copper producing processes. The electrolytic process is the principle settled on, the ore being broken up in a powerful rock breaker, conveyed to rolls and there crushed to necessary fineness; from thence to the long row of furnaces, and then roasted so as to free the ore from arsenical sulphurets; from there conveyed to huge tanks, where the ore is extracted by solution and from thence conveyed to the boxes or tanks wherein are placed sheets of lead in the liquid holding the copper, and the electric process collects the copper, which, after being all collected, is then stripped off in sheets from the anodes as stated. We found that the work has been going on continuously for over two years, and a very great amount of development work has been done. There is now probably some 50,000 tons of ore on the dumps which will be crushed and treated as soon as the electrical part of plant is finished, the work having been delayed for weeks in consequence of inability of electrical works to fill order given them. This ore, it is claimed, will yield from 2 per cent. copper upwards, and from numerous tests made and assays at various points the management confidently believe they can rely on an average value of 5 per cent. copper in all their ore; and as it is worth about—as I understand it—$3.00 per cwt. the values of this ore will average about $15.00 per ton. The management affirm that, with their plant and process, they can mine, mill and treat this ore for $2.50 per ton, hence it can be seen that very good values are to be looked for, and from explorations made over the company's property, which controls a very large area, it can simply be said there are millions of tons of ore in sight. The men who have promoted this company have full faith in their venture, and from the time of starting up to the present some $250,000 has been expended on development work—making roads, building houses and stables, shaft-houses, engine-houses, mills, and installing therein first-class and up-to-date boilers, engines, rock-breakers, furnaces, tanks, dynamos, and other plant, all built in the most substantial manner, so that one cannot help being impressed with the importance of what is seen. And all this has been done in a quiet and unostentatious manner, the outside world rarely hearing anything about it. The capital of the company is $2,000,000, headquarters at Providence, R. I.; and, without any waste of words, they deserve every credit for the thorough and systematic manner they have adopted in exploiting this mine, and it is to be sincerely hoped their fullest expectations may be realized. If they are, New Brunswick bids fair to have one of the greatest copper producing mines in Canada. I hope to give you more information on the mine at a later date for the columns of the REVIEW.

MINING IN NOVA SCOTIA.

The Egerton Syndicate who have taken over the New Egerton mine at Fifteen Mile Stream, Halifax Co. have sunk their main shaft to a depth of 165 feet, and cut the three belts worked by the old company. It is proposed to continue the shaft to a depth of 240 feet when cross-cuts will be driven out to and levels along the belts. The shaft, which is a double cage one with pump and ladder way, is being sunk at the rate of about 10 feet per week and it is expected that the mill will be started about the end of October. The mine is under the management of Mr. W. Borlase.

The National Mining Company have struck rich ore in the continuation of the old incline in their mine at Mount Uniacke. The mine is under the management of Mr. John Rentz, and Mr. F. H. Mason, of Halifax, is consulting engineer to the company.

The Great Belt Mining Company have nearly completed their thirty stamp mill at Mount Uniacke. The open cut is being pumped out and it is expected that milling will be started in October.

The East Lake Mine at Mount Uniacke have a lot of ore ready for crushing. All the mills in this district are closed down on account of the scarcity of water.

The Harrigan Cove Mine produced 230 ounces last month from 231 tons of ore.

The Truro Foundry Company have received the contract for the new mill being erected by the Baltimore & Nova Scotia Mining Co. The company are putting in 20 new stamps and remodelling the present 10 stamp mill. The plant will be equipped with Wilfley tables. A large new vein has beeu opened about 500 feet from the present one.

The Cheticamp Gold Mining Company's tunnel is now in 130 feet and an excellent body of argentiferous galena is reported.

Messrs. W. L. Libbey and B. F. Pearson, both well known in mining circles, are in the field of local politics, the former in the Tory interests in Queens Co. and the latter in the Grit interests in Colchester Co. The appointment of Mr. Arthur Drysdale, K.C., as Commissioner of Mines for Nova Scotia meets with universal approval.

MINING IN ONTARIO.

The quantity of natural gas exported to Detroit from the Essex oil wells averages one and a-half billion cubic feet per annum, or one-half of the Essex County field.

During 1900, 12 iron mines gave an output of 90,302 tons, valued at the pit's mouth at $111,805, being an increase over the previous year of 73,391 tons. A large part of this marked increase is due to the opening of the great Helen mine, in the Michipicoten mining division, a deposit whose importance and bearing upon the development of the iron industry of the Province is so great that it may be said to have wrought an entire change in the situation since its discovery. Of the total quantity of ore mined, 16,850 tons were magnetite and 73,452 tons hematite.

In 1895 some energetic and far-sighted men recognizing that a progressive community like Ontario furnished a home market for iron such as was hardly found elsewhere, established a blast furnace in the city of Hamilton having a capacity of 200 tons of pig iron per day. The furnace was a success from the start, and the company controlling it during 1900 added a plant for the manufacture of steel by the open hearth process, capable of making 80 to 90 tons a day.

The Hamilton Blast Furnace Company's example was followed in 1899 by the Deseronto Iron Company, which preferred to make charcoal iron, and whose decision to build a furnace in Ontario was in part due to a provision of the United States tariff that certainly was not intended to encourage the growth of manufactures in Canada. Large quantities of charcoal made at Deseronto were exported to Detroit for use in iron furnaces in that city, and with the desire of affording protection to the charcoal burners of the United States and of checking the imports of charcoal into that country, the tariff was amended to bear more heavily on that article. The somewhat unexpected result was to plant the charcoal iron business in Ontario, where unlimited supplies of wood were available, and where other conditions were almost as favorable as in Michigan. The charcoal business of Deseronto was not destroyed, but continued to flourish, and found its complement in the new industry for the making of charcoal iron of a superior quality.

Both these furnaces had the advantage of being blown in before the remarkable expansion of the iron industry began in 1899, accompanied as it was by an almost unprecedented increase in the price of pig iron, which doubled itself within a year. The Canada Iron Furnace Company, Limited, already carrying on a long-established and successful business at Radnor Forges in the Province of Quebec, next ente ed the field and erected a smelter at the town of Midland on the Georgian Bay.

The production of nickel in 1900 was much greater both in quantity and value than in 1899, being 3,540 tons worth $756,626 in the matte as against 2,872 tons worth $526,104, an increase in quantity of 668 tons and in value of $230,522. The same thing is true of copper, the output last year being 3,364 tons worth $319,681 as compared with 2,834 tons in 1899 worth $176,236, an increase of 530 tons in amount and $143,445 in value. It must be borne in mind that the figures of value given here are those for the metals in the form of matte before being exported for refining. If the price of the fine metals were made the basis of computation, the values would be many times increased.

Producers of nickel and copper had the advantage of an active demand throughout last year, and the average price realized for both metals was higher than for a number of years previous. Especially was this true of nickel, the selling price of which in the New York market advanced from about 35 cents per pound in January to 55 or 60 cents per pound in December. The average value of the nickel contents of matte at the Sudbury works as returned to the Bureau of Mines was $213 73 per ton or 10.686 cents per pound, and of copper $95.03 per ton or 4.756 cents per pound. These figures compare with $183.18 per ton or 9.159 cents per pound for nickel and $62.18 per ton or 3.109 cents per pound for copper in 1899.

The returns as to labor showed 1,444 employees at work in the nicke and copper mines of the Province, of whom 348 men and 2 boys were underground workers and 1,029 men and 23 boys were engaged above ground.

The Canadian Copper Company continues to be the chief producer of both copper and nickel, and its operations at Copper Cliff are on a larger scale than ever.

In purely copper ores, the old Bruce mines are undergoing complete renovation at the hands of The Bruce Copper Mines, Limited, an English company. Extensive works for the treatment of ore are in process of erection.

At Rock Lake also the Rock Lake Mining Company, Limited, are placing in producing condition a large and promising copper vein, the ore from which will be treated in the large concentrating plant now being put up. The railway from Bruce Mines on the shore of Lake Huron to Rock Lake, which was granted aid by the Legislature at its recent session, will be of material assistance to this company in greatly cheapening the transportation of machinery and supplies.

The Ontario Smelting Company is exploiting a copper vein near Massey Station, and is also building a refinery or rather a matte-concentrating plant at Copper Cliff for the purpose of smelting the copper ores from the Massey Station mine and of increasing the metallic contents of the Canadian Copper Company's mattes.

In eastern Ontario, the McGown and Wilcox mines near Parry Sound shut down about 1st December, after running in a fairly steady way for a considerable time. It is understood that work will be begun again in the spring. The Helena mine in the township of Barrie, Frontenac county, wa in operation for the whole of the year and is said to promise well. It is not yet in the producing stage.

MINING IN EASTERN ONTARIO.

By Prof. DeKalb, Inspector of Mines.

(Continued from August issue.)

ORFORD COPPER COMPANY'S SMELTER.

The Orford Copper Company is erecting a smelting plant for the further refining of the matte from the furnaces of the Canadian Copper Company, the location of these works being 400 feet southwest of the old McArthur No. 1 rock house at Copper Cliff. The plant will consist of a crusher house for breaking up the matte, a roast shed, and a furnace house. The equipment comprises a Blake crusher, a Krupp ball mill, a Brown straight line roasting furnace, 165 feet long, with hea·th 15 feet wide ; a 70-foot stack, a series of dust chambers, and two cupola furnaces. Power is supplied from two 125-h.p. boilers, and a 75-h.p. Atlas engine. There will also be a Cameron pump, a dynamo, and much additional apparatus, some of which is practically new in its application to smelting plants. The maximum capacity of the plant is calculated at 6,832 lbs. of high grade matte per hour. The resident manager of the works is Mr. S. C. Lake.

In addition to handling the Canadian Copper Co's. matte, it is intended to reduce here also the ores from the Massey copper mine, previously mentioned.

IRON MINES.

The iron industry of the Province is assuming a more satisfactory aspect than ever before. The Helen Mine at Michipicoton yields an ore of very superior quality and the quantity in sight is so large as to insure permanent operations for a long period. The Eastern mines have also been producing more steadily than for many years past, and the outlook for an increased production is very favorable. It is encouraging to note also that more systematic development work is being prosecuted, resulting in establishing the mines, where this has been done, upon a surer footing for the future.

THE HELEN MINE.

The Company controlled by Mr. F. H. Clergue, of Sault Ste. Marie, Ont., has developed the Helen iron mine beyond the experimental stage to that of large and steady production. The ore-body has been proved to have a longitudal extension of 1,100 feet and a height above the level of Boyer lake, (on the east shore of which the mine has been opened), of 97 feet ; and by diamond drilling it has been shown to extend at least 188 feet below the lake level. The only underground work conducted so far has been some drifting at the eastern end of the deposit. The main tunnel is 260 feet long with two branches. The southwest drift begins 31 feet from the mouth of the tunnel, and extends 85 feet ; and the northeast drift starts 50 feet from the tunnel entrance, and has a length of 35 feet. These workings are entirely in ore. The ore consists mainly of limonite and other hydrous oxides of iron, with an admixture of hematite. Its physical structure is admirable for smelting, being sufficiently hard to produce but little dust, and yet soft enough to admit of ready and rapid reduction in the furnace. The iron content averages about 58 per cent., the sulphur from 0.08 to 0.20 per cent., and the phosphorus from 0.011 to 0.067 per cent.

The actual mining is being conducted under contract by Messrs Powell and Mitchell, of Marquette, Mich., who employ about 400 men. At the time of my visit the ore was being hauled to the crusher above the railroad track, in tramcars drawn by horses, but a cableway was about to be put in operation, the towers being already in place. The span of this aerial cableway was to be 703 feet. The tower at the power station was 35 feet high, standing on a hill giving it an elevation above the railroad of 125 feet. The tower on the opposite side of the deposit was 70 feet high, with an elevation above the railroad of 115 feet. The crusher house stood 65 feet high, rising from the side of the track. At a height of 50 feet was located a Gates crusher, through which all ore passes to the loading bins below. The miners' camp consisted of a collection of buildings on a plateau above the railroad, behind the power station of the cableway. From here an inclined tramway for elevating freight extended 370 feet from the railroad to the plateau, which has an elevation of 150 feet above the lake shore. This is operated by a hoisting engine at the top. No Dynamite magazine had yet been built at the mine, the explosive supply being kept in two open sheds at the western end of Boyer lake. The main supply of dynamite was kept in a magazine several miles distant, along the line of the railroad.

Ore from the mine is hauled to the docks at Michipicoton Harbor 11½ miles distant over a section of the Algoma Central Railway. In addition to the permanent way, there are 1¾ miles of siding. In the construction of this line the earth excavation amounted to 143,000 cubic yards, hard pan and frozen earth 12,000 cubic yards, clay 11,000 cubic yards, rock cutting 48,000 cubic yards. The total of all fills amounted to 180,000 cubic yards, and other fills are yet to be made. The track is laid with 85-lb. steel rails with a ballast of sand and gravel. A trestle at present spans the Magpie river, which is to be replaced by a bridge now under contract, consisting of three 80 foot spans. The maximum grade is 2.7 per cent., and the summit level at the mine is 653 feet above Lake Superior. The rolling stock consists of 3 Mogul locomotives of 52 tons each, 100 steel ore cars of 100,000 lbs. capacity, 1 combination car, and additional box, dump, and flat cars. The engineer in charge is Mr. Henry F. Shipley.

At Michipicoton Harbor there is a wooden ore dock 275 feet long, owned by the Algoma Central Railway Company, containing 12 bins having a capacity of 50 tons each. The approach to the docks consists of a trestle 750 feet long, on a 12 degree curve. The track is 40 feet above the lake level. The depth of water alongside the dock is 24 feet. Ore will be stored during the closed season on the sand plain, 4 miles from the harbor.

Four hundred feet east of the docks is a pier 600 feet long by 60 feet wide, on which is a warehouse 180 feet in length. The basin between the pier and the dock has been dredged out to a depth of 24 feet.

Nine hundred feet east of the dock is a sawmill having a capacity of 2,000 feet per diem. At the head of the pier is the company's office, and near by are a hotel and a company's store, owned by the Algoma Commercial Company. The operations of the company have resulted in the growth of a town of considerable dimensions around the harbor.

THE WILBUR MINE.

This property, located about two miles south of Lavant, on the Kingston and Pembroke Railway, has been in process of development throughout the year. The owner, Mr. William Caldwell of Toronto, has been carrying forward a plan of development, blocking out ore reserves, but doing no stoping. The exploratory workings however are wholly in the deposit of magnetite, which averages about 28 feet in thickness, and the output of ore from the shafts and drifts has amounted to somewhat more than 6,000 tons, which is corded up along the siding from the railroad, no shipments having as yet been made. The stock pile has been sampled at frequent intervals, and is said to show an iron content of more than 60 per cent. with only a trace of sulphur and no phosphorus.

The new shaft, called No. 2, which was only being started at the time of my previous visit, is now 226 feet deep, on an incline of 27 degrees. At the bottom is a drift 40 feet long to the north, connecting with the bottom of the old workings, known as No. 1 mine. On the south side is a sump 20 by 12 feet and 8 feet deep, over which is located a Williams duplex direct acting pump, with a 2-inch discharge pipe. From No. 3 shaft, which is connected at two points with No. 2, as explained in my report for 1899, a new incline has been driven part way through to No. 2 shaft, serving as a sump for the drainage from this part of the mine. There are two levels started in No. 2 shaft, one at a depth of 100 feet, and another at 150 feet. The existence of ore in advance of the workings for a distance of 300 feet has been demonstrated by diamond drill borings.

The old No. 1 mine has been drained, revealing one long gallery at the bottom, with large stopes above, extending nearly to the surface. Pillars have been left, and walls of waste rock have also been built supporting the roof. The workings are secure in the lower part, but are somewhat treacherous near the surface. This mine, however, is not used for any purpose other than to afford further ventilation for the new workings, so that absolute security of the roof under the circumstances is unimportant. A roof fall here would not endanger any part of the new mine. The dynamite thawing house is now heated by steam, and is kept in good condition, but was left unlocked, to which objection was strongly made. The handling of all explosives is entrusted solely to the mine foreman. There is no ladderway in shaft No. 2, but there is a good manway in No. 3, which is the easier route for entering the mine. The surface plant remains unchanged. Attention was called to the absence of any brake on the hoisting drum, and it was urged to make good this deficiency at once.

THE ROBERTSVILLE MINE.

The Robertsville mine, also known as the Lizzie mine, has made excellent progress under the management of the lessees, Messrs. F. W. Schwendiman and Thomas Barnes. No new plant has been erected, but the mine has been brought into a better condition, rendering it both safe and easier to operate. The old floor-arch forming the floor of the first level has been removed, throwing the upper and lower stopes into one. The hanging wall has been scaled, and the skipway has been extended to the bottom of the mine, making a total length on the incline of 194 feet. For a distance of 84 feet, the inclination of the skipway is 45 degrees, at which point it changes to a slope of 79 degrees. A ladderway follows the skipway to the bottom. The stoping chamber at the bottom measures 30 by 88 feet. Its widest point is 110 feet from the mine mouth, where it measures 57 by 108 feet. At the mouth it is 26 by 36 feet. As will appear from these dimensions the mine is only a deep open pit. There is still magnetite ore in considerable quantities on the foot wall of the stope, but the hanging wall is clean, sound country rock. Day and night shifts are being worked, using steam drills. The output of ore for a considerable period has averaged 40 tons per diem. At present the shipments amount to 50 tons a day, and the stock pile is estimated to contain 2,000 tons. Dynamite is stored in an old frame house half a mile distant from the mine, and a small supply of about 300 lbs. is kept in a locked magazine 450 feet east southeast from the pit. Thawing is done in a proper manner with a hot-water thawer. The address of the lessees is Clarendon P. O.

THE ST. CHARLES MINE.

This is a newly developed mine on lot 19, concession XI, Tudor township, Hastings County. The owners are The Anglo-American Iron Company, whose principal office is in Cleveland, Ohio. The operators are the Cataraqui Mining and Development Company of Ontario, with offices in Madoc. The general manager is Mr. Chas. L. Meyer; consulting engineer, Mr. Leopold Meyer; and superintendent, Mr. Freeman J. Daniels of Millbridge. The directors are Hon. P. McLaren, Hon. J. McMillan and Mr. E. S. Leetham The mine lies 5 miles north of Millbridge and 1 mile southwest of McDonald siding on the Central Ontario Railway.

The ore is magnetite, with more or less calcite, occurring in an apparently well defined vein having a strike north 45 degrees west, lying between dioritic wall rocks. The vein evidently occupies a position along a fault plane, with which is associated an intrusion of a dark, fine-grained basic volcanic rock. There has been movement of the walls subsequent to the original ore filling, followed by deposition of calcite. This was shown by the crushed and broken hornblende crystals, healed by calcite. So much of the geology of the deposit was easily observable on a very superficial examination. A careful examination of the geology of this vein should prove highly instructive.

The workings consist of an open cut, with three pits, having a total length of 500 feet. The length of the outcrop as shown by a number of test pits is 1,000 feet, with a width varying from 20 to 40 feet. During the season there have been shipped 3,000 tons of ore from this mine to the Hamilton blast furnace, which gave an iron tenor of from 57 per cent. to 60 per cent., with some as high as 64 per cent. The ore contains no phosphorous, but shows from 0.5 to 1 per cent. of sulphur. There are at present 1,500 tons of ore on the stock pile awaiting shipment. The high grade of the deposit is evidenced by the fact that in extracting the aforesaid 4,500 tons only 200 tons of waste were culled. Hoisting is by derrick, and drilling is done with steam drills. Five hundred feet east of the mine is a boarding camp for 40 men, a blacksmith shop and a foreman's house. Dynamite is stored in a temporary magazine 500 feet north of the mine.

THE DUFFERIN MINE.

This property lying just south-east of the station of Malone on the Central Ontario Railway has been working during the season, under the direction of Chas. Bulpit for Thomas Barnes of Hamilton. A tunnel 100 feet long has been driven, connecting with a shaft. The mine was producing 3 carloads a week until the Hamilton blast furnace was closed.

THE WALLBRIDGE MINE.

This mine, on the east half of lot 12, concession V, Madoc, is still in operation, with some promise of continuing to be a steady producer. The ore is a soft red hematite. Operations have been carried on for four months, yielding from 15 to 20 tons of ore per diem. The old shaft extending 35 feet below the present working, is now filled with debris, but will be cleaned out as mining proceeds. The depth from the edge of the pit to the working place is 60 feet. The side wall of the pit was apparently insecure, and instructions were left to set a row of stulls, and lag them closely so as to protect the miners below. Hoisting is done by derrick. Dynamite was kept in a small building on the edge of the pit. The erection of a suitable magazine at a proper distance from the mine was required. The mine manager is Mr. Campbell Wallbridge.

THE SEYMOUR MINE.

The Seymour iron mine was one of the earliest producers of iron ore in Ontario, and had been abandoned for many years. It is now being pumped out preparatory to active operation by Mr. Stephen Wellington of Madoc, who has obtained a lease of the property from the owner, Mr. Fred E. Seymour of Madoc. It is located on the west half of lot 11, concession V, Madoc township, 4 miles north of the town of that name. The old shaft is said to be 125 feet deep. The water had only been lowered to a depth of 40 feet at the time of my visit, revealing an old open stope 200 feet long east and west, varying from 18 to 22 feet wide, and dipping 60 degrees toward the south. The stope had once been well timbered up, but these timbers have mostly rotted and fallen. As was pointed out to the lessee, it will be necessara to set a row of stulls above the old level to insure safety. A 10-h.p. boiler now furnishes steam to the pump, and a horse whim is being set up for hoisting. The attention of the owner of the property was called to the regulation requiring the fencing of open workings.

This old open stope has remained unfenced for many years, and while no serious accident has resulted, the remains of cattle and sheep were found

in the pit on pumping it out. It appears that practically no attention has been paid to the law on this subject, so far as old abandoned mines are concerned, throughout the Province. Nearly all such workings which I have visited have been found in the same condition as the Seymour mine, in this regard.

CALABOGIE MINES.

These mines, controlled by the Hamilton Steel and Iron Company, have been shipping on an average about 125 tons a day during the season. The pit has been but slightly deepened, the ore being extracted by enlarging its diameter.

The Calabogie Mining Company has also pumped out its pit which lies on an extension of the same deposit, and development has been progressing during a considerable part of the summer.

KATHERINE LEAD AND ZINC MINE.

This property is located on lot 7, concession XI, of Lake township, Hastings county, 3 miles northwest from Millbridge, embracing 300 acres. The owners and operators are The British Colonial Mining and Development Company of Ontario, Limited, with offices in Millbridge. The manager is Mr. Charles L. Meyer, with Mr. Freeman J. Daniels as superintendent. The directors are Messrs. Charles L. and Leopold Meyer, Col. Charles E. Turner and Mr. E. S. Leetham of Ottawa, and Hon. J. McMillan.

The vein carries argentiferous galena and zincblende in calcite, the average of the ore showing 10 ounces of silver. It lies wholly between walls of diorite, with a width varying from 1 to 4 feet, and a known longitudinal extension of half a mile. Explorations have been carried on by diamond drill borings to a depth of 292 feet, and by a shaft 125 feet, consisting of two compartments. For a depth of 50 feet it is vertical, and then inclines east 60 degrees. At 100 feet is a drift 100 feet to the north, with a stope 30 feet high and 50 feet long, beginning 10 feet from the shaft. Hoisting is done with a 25-h p. hoisting engine, taking steam from a 40-h.p. boiler. The shaft house is 22 feet square on the base, 12 feet square at the top, and 50 feet high. Adjacent is the boiler house, 60 feet by 25 feet. There is also a blacksmith shop, a boarding camp for 30 men, an office, and stables.

Half a mile south of the former shaft is the south shaft, 9 x 18 feet in cross-section, and 18 feet deep. The vein here is less highly mineralized, having, however, a width of 9 feet, with six ore-bearing streaks, containing galena, but no zinc. The mines are at present idle, but work will soon be resumed.

HENDERSON TALC MINE.

A very interesting and important discovery of talc has been made at a distance of a mile and a half from Madoc on the north shore of Moira lake, by Mr. James E. Harrison of that place, by whom the property is being worked under lease. The location is on lot 14, concession XIV, of Huntingdon township, Hastings county. The talc vein averages 36 feet in width, and has a strike north 40 degrees west, cutting across the strike of the tilted dolomite in which it occurs, the latter bearing north 10 degrees west.

The talc is of exceptionally fine quality, entirely free from grit, and being practically uniform across the full width of the deposit. Eight hundred tons of the material have been shipped to New York during the summer, representing nearly the total of all rock raised, the culls from this amount being only 5 tons. The shaft is now 43 feet deep, with a cross section of 18 x 20 feet. A pit-head frame, closed in, has been erected over the shaft with horse-whim shed adjacent. Hoisting is done by bucket. Preparations were being made at the time of my visit to put in timbering, owing to the tendency to slips which were becoming dangerous. Dynamite was stored in a magazine 900 feet distant.

CANADA CORUNDUM COMPANY, LIMITED.

Regular work has begun at the corundum mine seven miles south of Combermere, by the Canada Corundum Company, Limited. The head offices of the company are in Toronto, with a branch office in Bridgeport, Connecticut. The officers are: President, Clark Edwards, Bridgeport, Conn.; vice-president, J. H. Shenstone, Toronto; and manager, B. A. C. Craig, Toronto. The superintendent of the mines and works is Leverett S. Ropes.

The properties being worked are in the 18th concession of Raglan, Renfrew county, known as the Robillard property. The company has also located 1,200 acres out of the 2,000 acres allowed by the Government. The mines are on lots 3 and 4, Concession XVIII of Raglan, and the mill is half a mile southwest on lot 2. No underground development has so far been done, and in this case it will be unnecessary for a long period, the width of the deposit and the length of the outcrop over a high hill revealing a sufficient supply for many years, which may be cheaply obtained by quarrying. The rock extracted yields from 12 to 15 per cent. of corundum. It has been found that the rock containing the mineral fairly well disseminated in the form of relatively small crystals produces the finer grade of material, and the operations are being confined chiefly to that portion of the deposit where this charater predominates.

The mill is situated on lot 2, consisting of the old W. E. James' sawmill remodelled for the purpose. The plant contains a No. 2 Gates crusher, a pair of 14 x 24-inch Gates rolls, 2 double-compartment Hartz jigs, a Wilfley table, and a Bartlett concentrator. With this equipment the capacity of the mill is 20 tons of rock per diem. Additions are being made, the new equipment consisting of 3 Hartz jigs, 1 pair of Sturtevant centrifugal rolls, 16 x 6 inches, with a crushing capacity of 40 tons a day, and a magnetic separator for removing magnetite. The mill is driven by a 40-h.p. 5-nozzle Leffel water-wheel of the hurdy-gurdy type, located 315 feet south of the plant and 420 feet from the dam. The power is transmitted by a wire rope driver. The present mill is regarded only as experimental, and plans are under consideration for reconstruction at a point just below the mines, where ample dumping ground for tailings is available. This plan would involve the fluming of water from Echo lake, which would afford a large supply under a higher head than can be had at the present mill-site. Other buildings on the property are an office and blacksmith shop near the mill, and a boarding camp midway between the mill and the mine. The dynamite magazine is located on the south-west corner of lot 4, five-eighths of a mile east from the mill. It is built of logs, well-ventilated, but needed chinking and cleaning. It contained one ton of dynamite. The force of workmen employed numbered 45. A short road is being built from the mine 3 miles to François' landing on the York river, distant 4 miles from Combermere.

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Consolidated Mines Co. of Lake Superior, Ltd.—Incorporated 23rd Aug., 1901. Authorized capital, $1,000,000, in shares of $1.00 each. Head office: Port Arthur, Ont.

Gopher Mining Co., Ltd.—Incorporated 23rd Aug., 1901. Authorized capital, $1,000,000, in shares of $1.00 each. Head office: Fort Frances, Ont.

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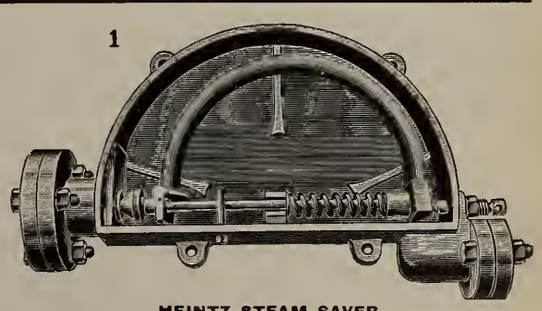

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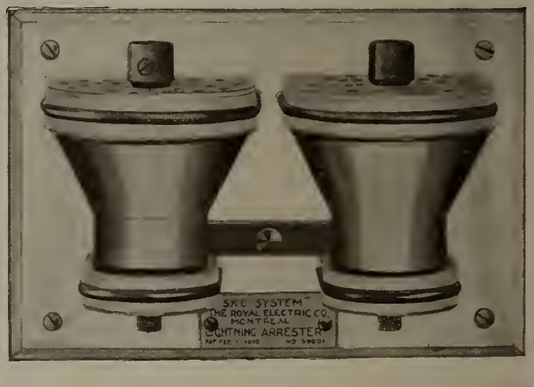

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In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

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1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental – such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

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Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

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The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

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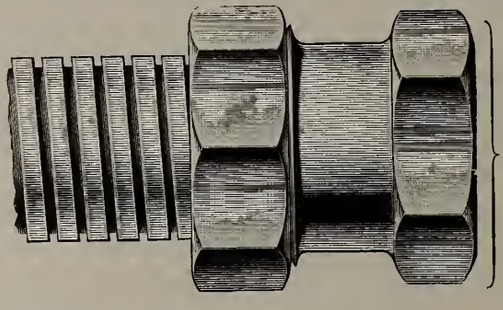

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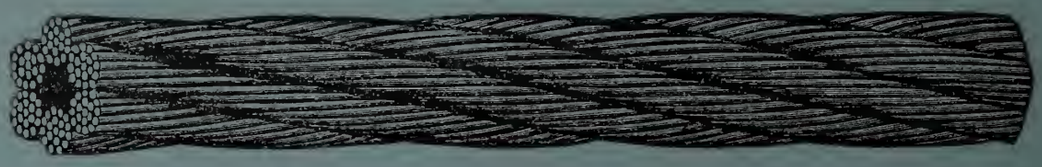

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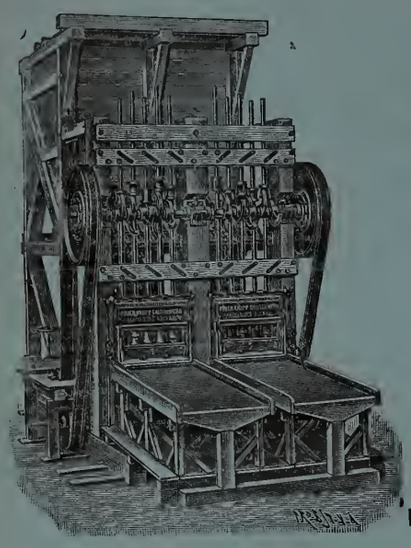

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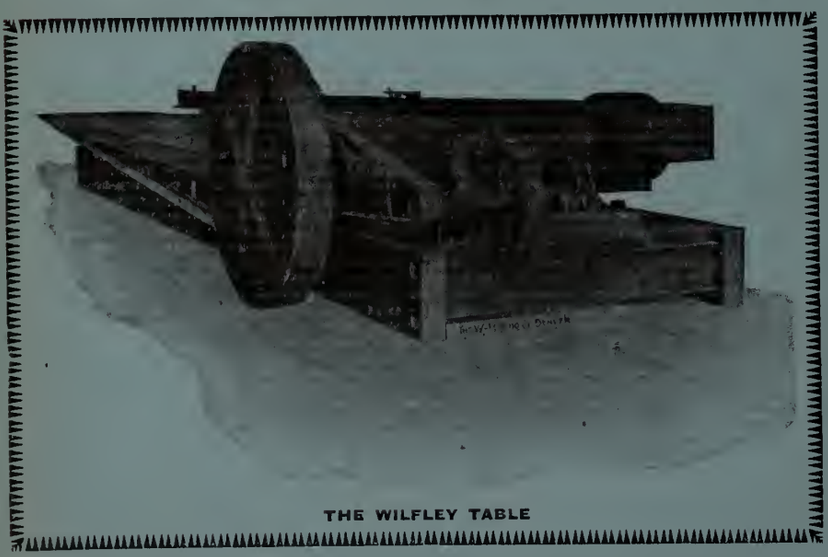

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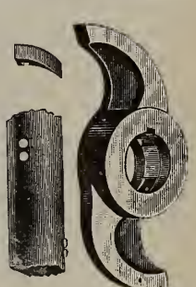

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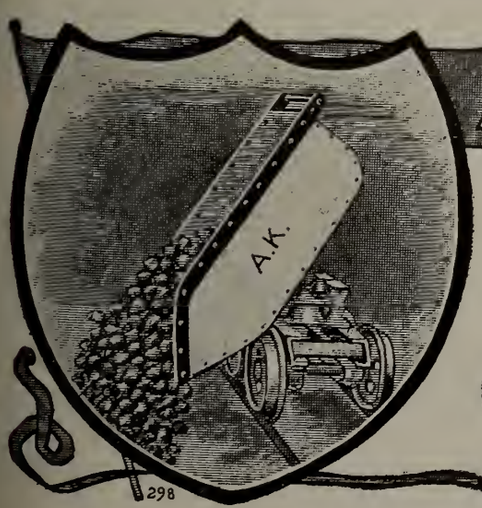

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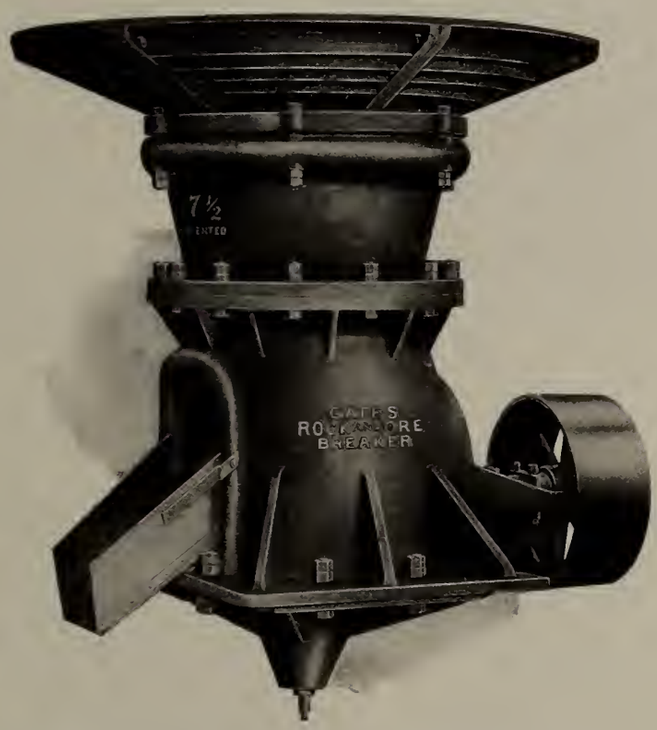

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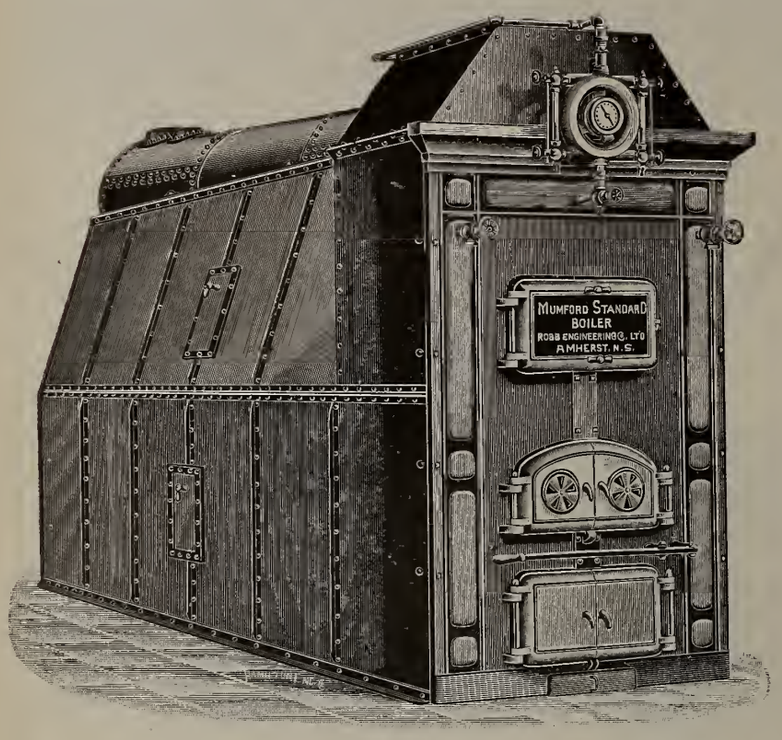

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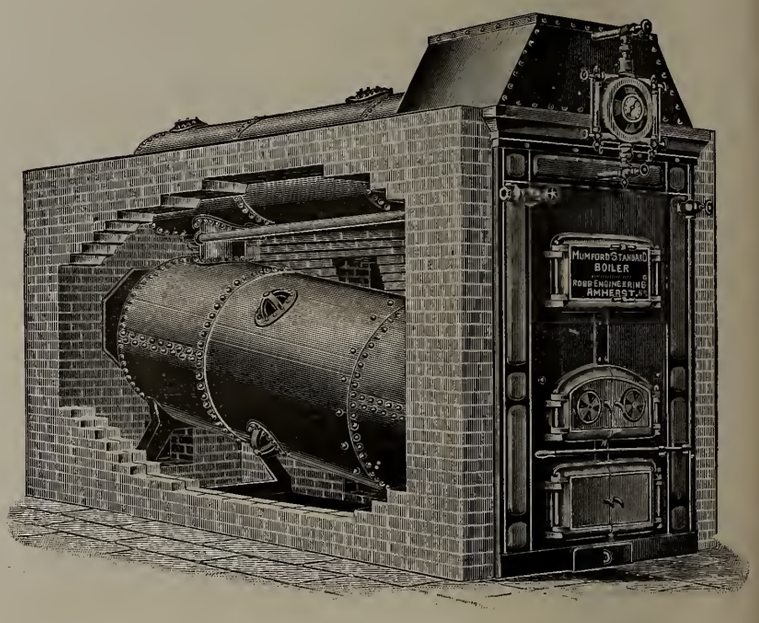

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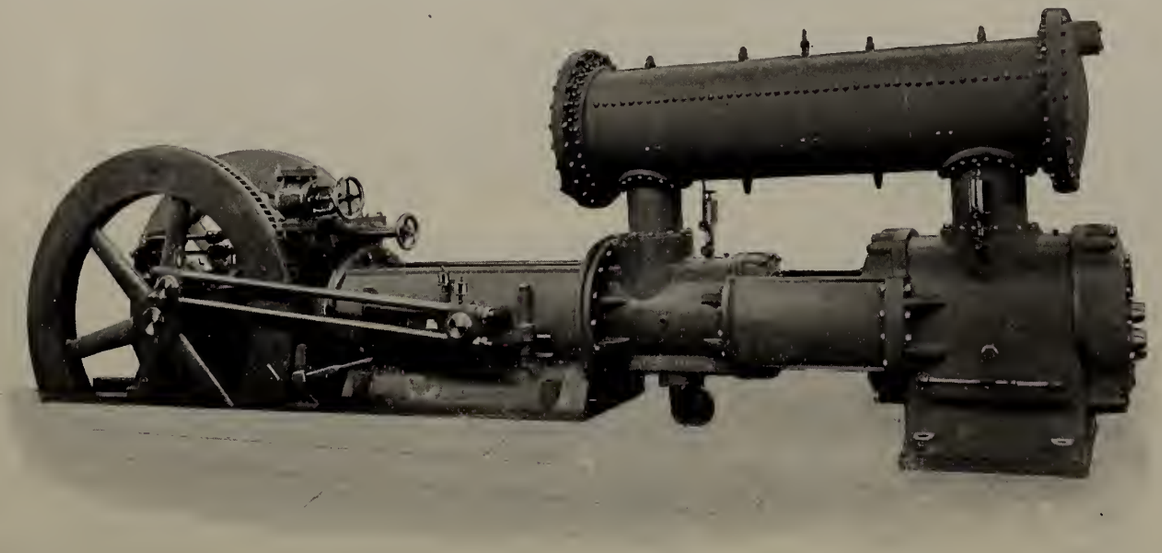

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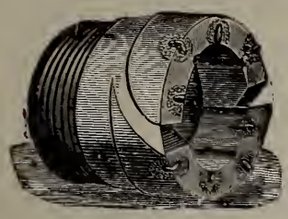

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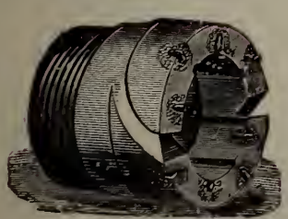

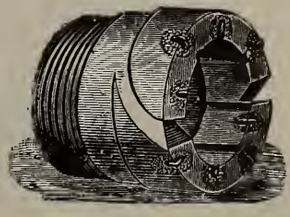

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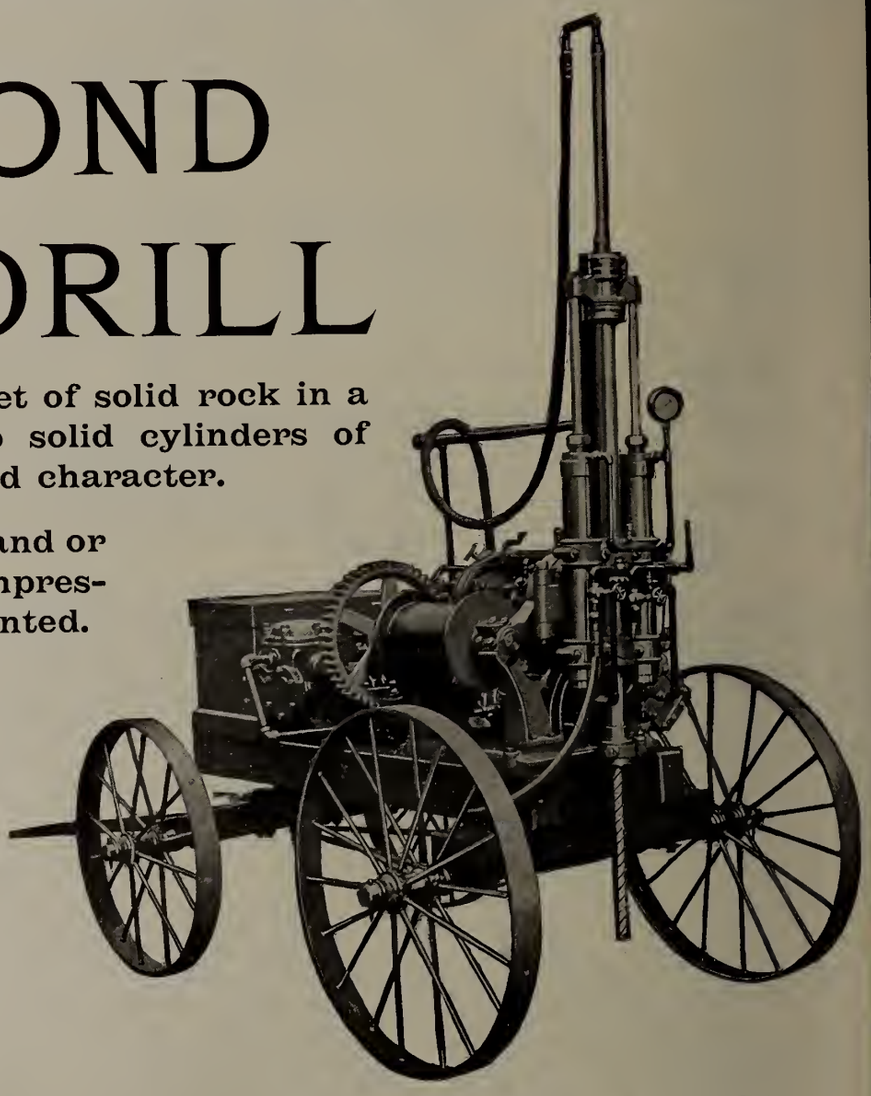

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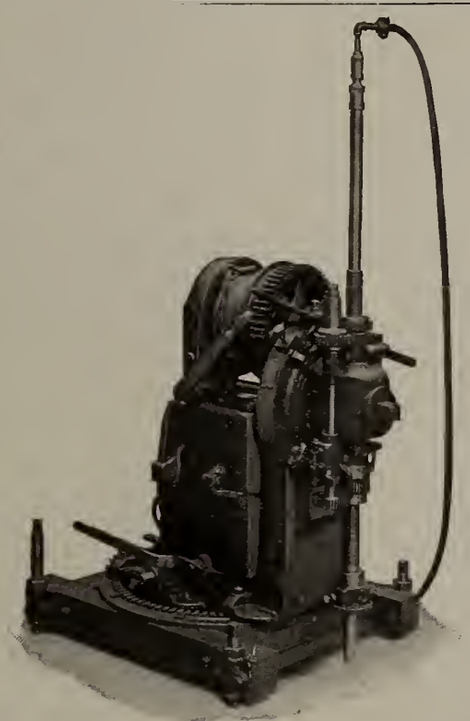

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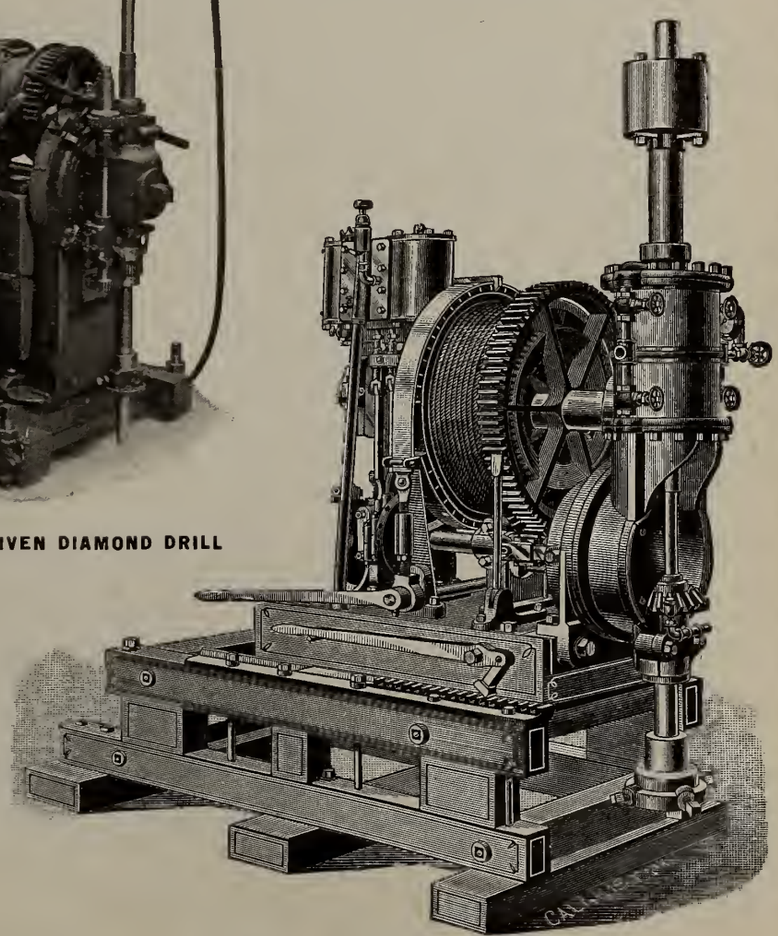

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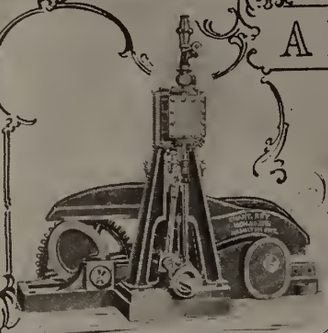
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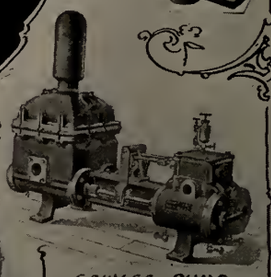
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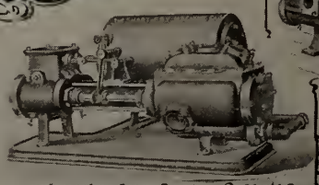
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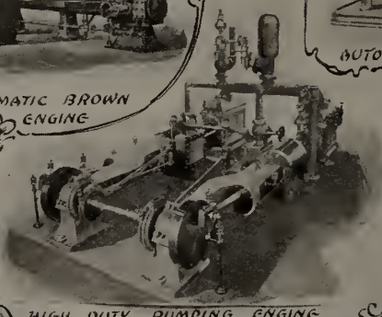
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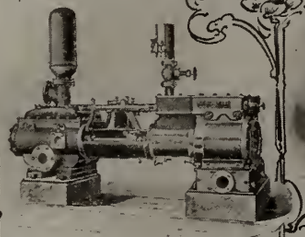
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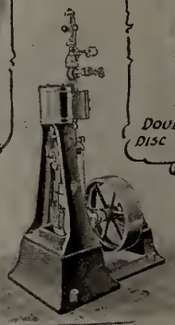
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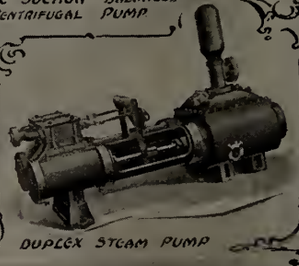
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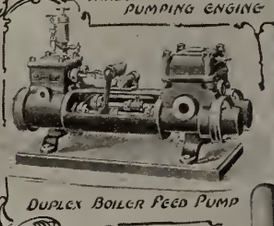
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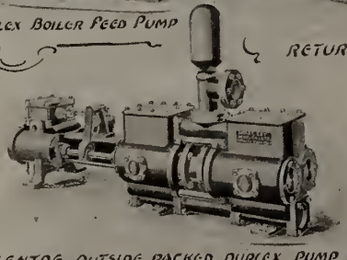
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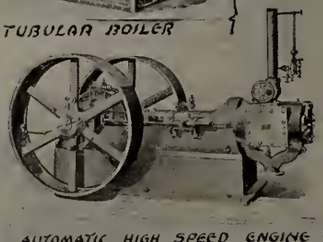
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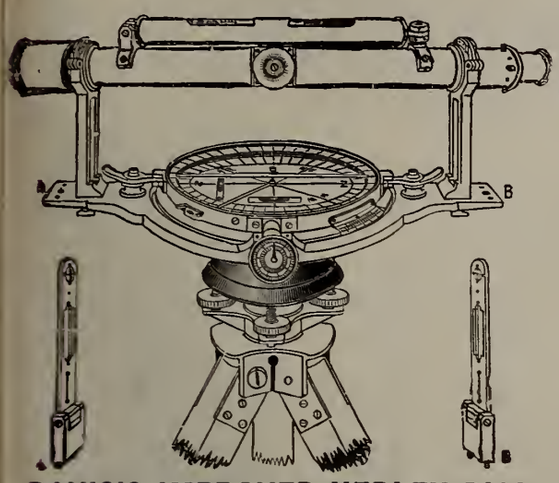

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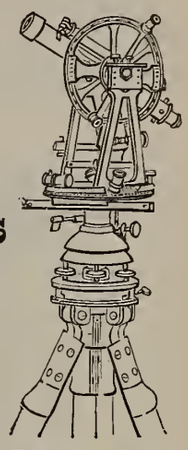

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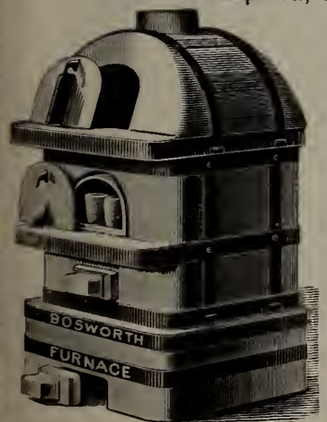

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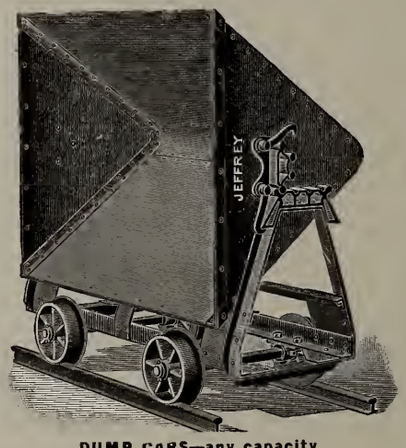

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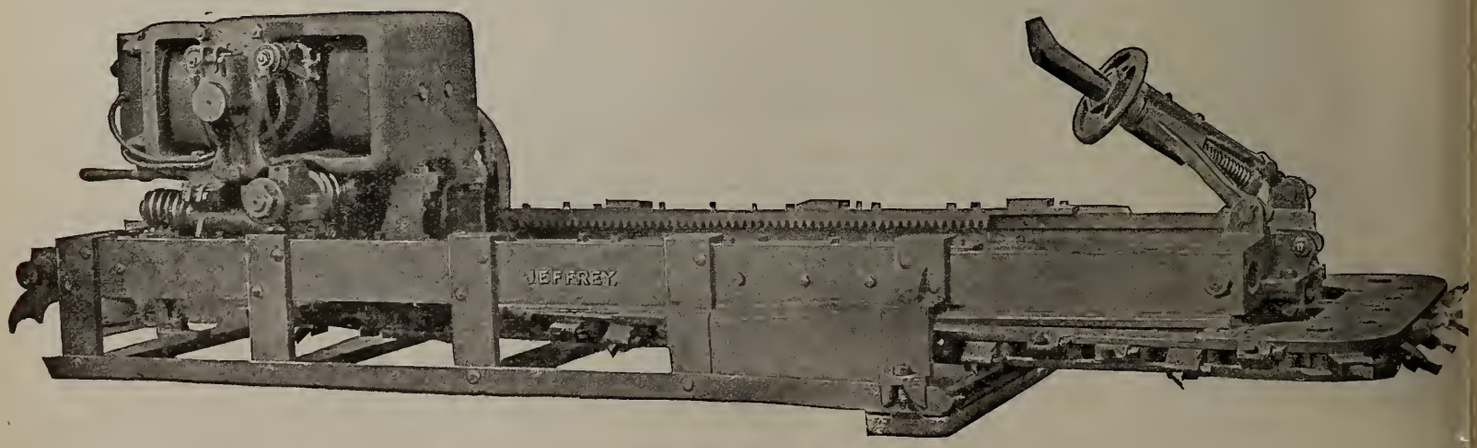

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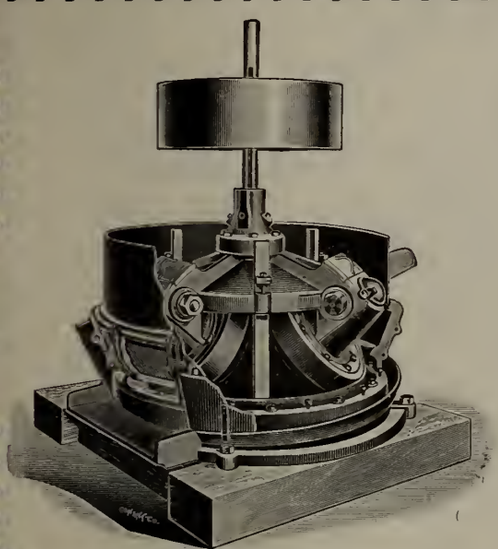

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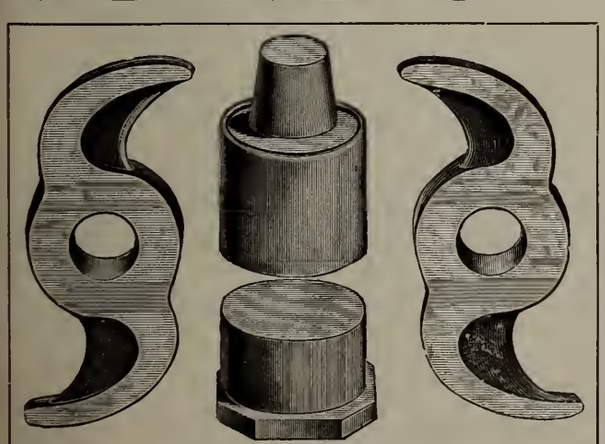

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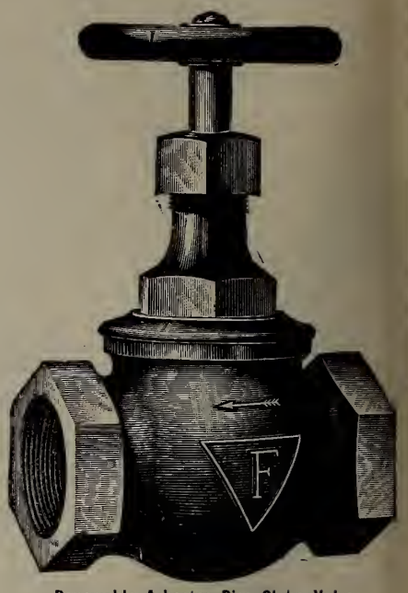

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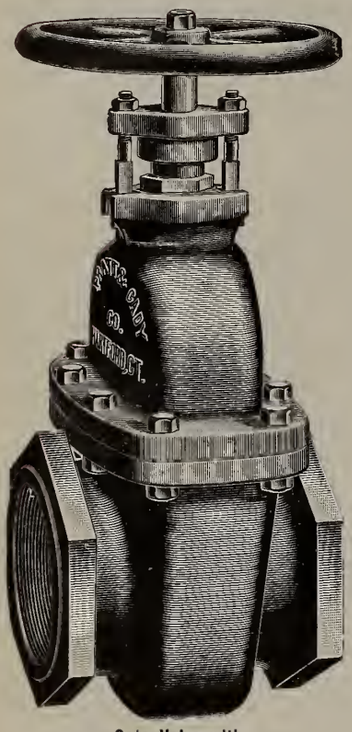

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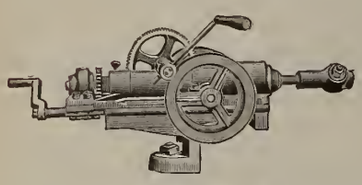

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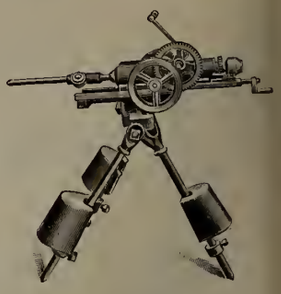

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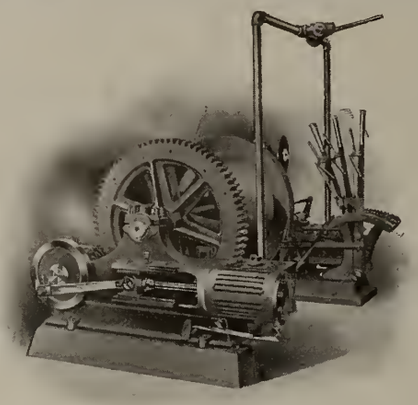

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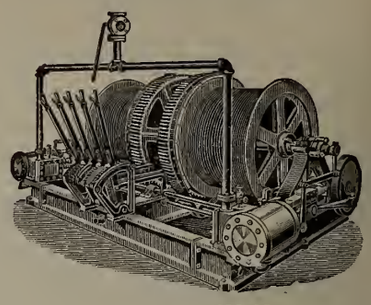

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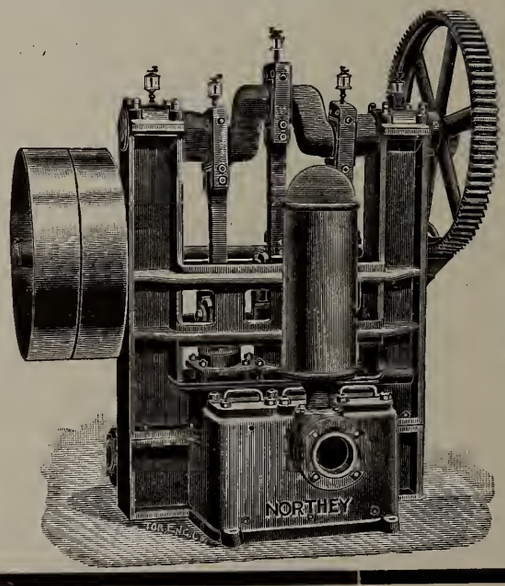

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19th YEAR OF PUBLICATION.

The Canadian Mining Review

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

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Concerning Mine Management.

Information concerning several properties in Canada has recently been received by the REVIEW which emphasizes the embryo character of much of the mining work that, as a generality, has been done in the newer regions of Canada during the "boom" times of the last five or six years, and it clearly shows the want of men who have been trained in the principles of mine management.

It is a truism that the majority of men who have been put in charge of the important work of opening and developing mineral properties in the newer portions of Canada have been, to put it very mildly, novices, entirely inexperienced and untrained.

That such a group of incompetents has done more to wreck mining corporations and create adverse capitalistic opinion than the demerits of the properties themselves, is apparent to any student of the situation. The gross incompetence of the management rather than "inadequate mineral resources" has been the rock upon which most of the mine promotions of the last five or six years have been wrecked.

We have seen subservient prospectors and workmen, who have become the blind tools of the promoter, rewarded with the superintendency when the promotion became a fact, and the treasury was full. Promoters themselves, in some cases, have filled the office of general manager because their temporary residence in mining camps had familiarized them to a certain extent with the use of some technical terms. Ambitious young graduates of mining schools, whose experience was *nil*, but whose needs were considerable, have been employed at cheap wages ($100 a month or so) by companies whose funds were extremely limited, and whose funds after such an appointment have been *nil*; men whose abilities and experience as shift bosses, foremen, assayers or book-keepers was unquestionable have been put in charge as superintendents or managers because of their honesty, but with disastrous results as managers.

These errors have most frequently been committed by English and Canadian companies; the former for reasons which have already been alluded to in former numbers of the REVIEW, the latter because of their general ignorance of the whole subject of mining; the American companies have managed somewhat better, as they should have done from their greater experience in this line. It is easy to mention specific cases in specific places. In the Yukon, at Atlin Lake, in the Kootenays, both East and West, and in the gold fields of Western Ontario examples are frequent where the working capital of the company has been totally expended without results, because of the manager of the company not knowing *how* his work should be done, or because he was not able to have it done economically, or because he frittered it away in expenses that were not directly connected with the development of his property. In one case a mortar block for a stamp mill was put down upon a rock surface which had a slope of 35°, the manager congratulating himself upon having a "solid rock" foundation for his mill. At the end of one year, which was a disastrous year financially, the superintendent "wondered" how it was that his stamps were striking the back of his mortar, and had to "wonder" until a visiting engineer called attention to his foundation. In another case a promoter, with the title of managing director and mine manager, has been unable to erect a 20-stamp mill and accessories with $60,000. In another case an English corporation with an abundance of working capital entrusted the selection of properties to a young English engineer of no experience, to whom they paid the magnificent stipend of £300 per annum, at the same time entrusting him entirely with the expenditure of some £50,000 of capital. In this case it is unnecessary to say that the results were nothing. In another case a man with a good reputation as a mine examiner or geologist, but who was totally inexperienced in the *practical* engineering work required at a mine, put his shaft-house on the highest point of his property, thereby necessitating the haulage of fuel and all supplies up a steep grade to a height of nearly 200 feet more than was necessary, and equipped this shaft house with machinery, etc., which to-day has been relegated to the scrap heap. Some time ago a foreigner, placed in charge of a Canadian property, chanced to see a Tremaine stamp mill at work in another country; by some unexplained method of figuring, this so-called engineer saw a tremendous economy in the use of this steam stamp over the gravity stamp, and at a large expense to his company tore down the existing gravity stamp mill and erected batteries of Tremaine stamps, with accessories totally inadequate and unnecessary; the sequel of all of which was the collapse and shutting down of the entire property.

The point of all this is that the country and the mineral properties have no call to be condemned. It is very rarely that one hears of the condemnation of the manager, but the property is reported to be "no good," not the man in charge; and it is to this item as well as to the exceedingly bad financial methods which have been practiced as regards some Canadian companies, that is due the disappearance of British Columbia and other Canadian mines, not only from the eastern market but also from the London market.

It may pertinently be asked by the reader whether the science and mining schools connected with our universities are not turning out trained mining engineers who are available for such positions? The answer unquestionably is, "No;" that they are not turning out such engineers, nor can they do so, for the reason that no schools can turn out men who are competent to direct operations as a whole, because

such competence comes only from experience, and somewhat wide experience too. This necessary experience has impressed upon the man who has had it, the necessity for economy and for creeping before walking. The knowledge that if one is to make a success he must spend less than 100 cents out of every dollar received, is the knowledge that our technical schools do not teach. Mining is taught as a science and not as a business, and no provision is made in the curriculums of the scientific schools for the infusion of a little of that hard horse sense, as it is called, which means practically a business training. There is no panacea to cure this evil With the increased experience of Canada in mining will come an increased number of men whose training has been adequate to enable them to handle mines successfully. To the investors who have already tried the incompetent manager and lost their money, it would appear useless to say, "Try again with fresh money and with experienced men."

The Outlook for Copper.

A hundred and one reasons have been assigned for the breakdown in copper. What may be the immediate explanation, it would be hard to say. One, which referred it to the action of the Amalgamated Copper Company, has been contradicted. It was to the effect that that concern had an intention to start a crusade against the market in order to break the price with the object of creating a situation that would compel the Rio Tinto Company to join the "combine." It has long been known that the individuals who direct the affairs of the latter have from the outset cherished a hope that they would be able to capture the British company, and that they were prepared to pay a handsome price for the alliance. It was several months ago said that they would willingly pay $300.00 per share for a block of Rio Tintos which would suffice to give them control. That may have been an exaggeration, but there can be no doubt they would have been agreeable to offer handsome terms to effect a "deal" which would have greatly strengthened their hands and been of immense assistance in enabling them to make another step in advance in furthering a policy designed to secure command of the market in the two hemispheres.

There is, however, no necessity to assume speculative machinations as a prime or even an important contributory cause of the fall in the price of copper. It is much more reasonable to conclude that demand and supply have been the two most potent influences at work. During the industrial "boom" of the last three or four years an immense stimulus was given to consumption by reason, for the most part, of the great expansion of the electrical industries. This was especially the case in Germany. While the excitement lasted, a sharp impetus was given to the price, which rose from $250.00 to about $400.00 per ton. In 1898 the production of the whole world was a trifle over 424,000 tons, and the average price about $250.00 per ton; while last year the average price was over $365.00, and the output about 486,000 tons, so that while the price rose over 43 per cent., the production only increased a trifle over 14 per cent. When the copper "boom" was in full career, and merchants and speculators, though in many cases deprecating what seemed to them to be a tendency to undue inflation, expressed the view that the metal was destined to remain at a permanently higher level than in the past, and fixed in their minds an average of about $350.00 as a reasonable figure. It was suggested that the excitement would, like all such displays in the past, be ephemeral, and that if the demand was to be kept at a normal level the price would have to come down to about $300.00 as a maximum. Last month it fell to $300.00, from which there was subsequently a moderate rally. While the increased demand helped to lift the price to an average of about $365.00 during the past couple of years, there can be very little doubt that clever manipulation by the Amalgamated Copper group also aided the movement. The output controlled by the "combine" is about a hundred and eighty thousand tons per annum, which is rather more than seventy-five per cent. of the total American production, and a little over thirty-seven per cent. of the entire world's output, the latter being, roughly, 486,000 tons. In order to sustain the price, it has for some time past been restricting its sales, and it is reported—and the statement is made by the late manager of the United Metals Selling Company, which has the handling of the metal of the "combine"—that the latter had on hand at the beginning of August last an accumulated stock amounting to about 60,000 tons. The impression is, that since that time this stock has been largely added to, in which case it is not improbable that the "combine" is carrying upwards of one-third of the total American output. The stock of the metal in Europe is estimated to be only one month's consumption, and from this the inference has been drawn that it would require a very little increase in the demand to give a fresh upward impulse to the price. It has, however, to be borne in mind that the moderate extent of the European supply is mainly due to manipulation by the American "combine," which has been a persistent importer of "standard" metal for the purpose of supporting the market; so to suppose it can go on indefinitely playing the same game would be absurd. What its actual financial resources may be there is no possibility of ascertaining. The fact that it has a capital, as represented by its stock, of over thirty-one millions sterling is no guide to its actual pecuniary strength, seeing that the foregoing capital represents, as to a very large percentage, mere "water."

The one broad fact, to which too much weight cannot be given in considering the position and prospects of the copper market, is that the general industrial conditions now prevailing in Europe are vastly different from what they were a year or eighteen months ago. There has, for instance, been something like a collapse in electrical enterprise on the other side, the demand in connection with which was the backbone of the copper "boom," and from what has happened of late in Germany, France and Belgium, it would be the height of folly to suppose that the requirements of this branch of business will for a considerable time to come be of anything like the large dimensions attained in 1899. Since then this continent has produced far more of the metal than was needed for home consumption, which there is reason to believe is also on the wane. The "hidden" stocks in the United States must be much more extensive than one would be warranted in inferring from published statistics, and there is no evidence that production, either there or elsewhere for that matter, is being reduced. The companies controlled by the "combine" might decide to diminish their output, but that would not necessarily prompt like action on the part of other producers, while so far as outside producers are concerned they, in consequence of the want of an understanding or of any kind of solidarity among themselves, will be guided in what they do by ordinary business considerations. Until quite recently attention was given much too exclusively to the supposed increasing requirements of the trade. It was only a short time ago stated by a gentleman, who is regarded as an authority on the subject, that consumption was keeping level with production throughout the world, that stocks were bare, and that in order to meet the needs of the expanding electrical industry some new source of supply would have to be found in the course of the next few years. Equally fantastic calculations were indulged in during the great Secretan gamble, the end of which was disastrous. There is no need to dive deeply into statistics in order to arrive at the conclusion that this copper business has been overdone. It was no mere accident which brought down the price from nearly $370 per ton at the opening of the present year to within a trifle of $300 last month. The point to be borne in mind is that in 1898, with a total production of 424,000 tons, the average price was about $255, and that the output will this year be very considerably greater; so that, assuming that trade and industrial conditions continue at

MR. R. RANDOLPH BRUCE, B.Sc., C.E.,

Manager and part owner of the Paradise Mine, Windermere District, B.C.

their present level, or that there is a reversion of those prevailing at the earlier period, there would be nothing surprising if a still further decline in the price of the metal took place notwithstanding the most strenuous efforts on the part of the United States "combine" to support the market artificially.

Some English Methods.

The issues of the London financial papers during the last two months have contained many articles, long and short, with reference to the collapse of the remarkable combination which embraced the London & Globe Financial Corporation, the British America Corporation, the Standard Exploration Company, and the half-dozen subsidiary companies formed therefrom or thereby. The whole of these articles are extremely interesting reading, but are too long to be reproduced. Condensed into as small compass as possible, the story is that the British America Corporation, registered in October, 1897, was promoted by the London & Globe Company in December, 1897. The capital was £1,500,000, of which £1,000,000 was offered for subscription; £200,000 was reserved for the Standard Exploration Co., and £800,000 was subscribed by the public.

The Hon. Chas. H. Macintosh had, prior to December, 1897, sold options (in British Columbia and the Yukon) to the London and Globe Financial Corporation for £100,000; these same options were sold to the newly formed company, the B. A. by the London and Globe for the price of £500,000. The first property acquired was the LeRoi mine for which the British America Corporation paid in cash the sum of $3,280,000. In conjunction with the London and Globe Company the British America Corporation registered the LeRoi Mining Co. with a capital of £1,000,000. The profit on the turnover to the LeRoi Company amounted to £165,000 stg. which was equally divided between the British America Corporation and the London and Globe Co. Following this transaction rapidly were the flotations of the East and West LeRoi and Columbia Kootenay properties, no part of the capital of which was issued to the public, and none of which possessed any working capital, which was provided solely from the treasury of the British America Corporation.

The effect of these transactions was a paper profit to each of the parent corporations, the British America Coporation and the London and Globe, of nearly half a million pounds, and a very important question, which will be decided in the future, is whether or not there was a partnership between the London and Globe and the British America Corporation, and, if so, to what extent the liabilities of the British America Corporation will affect the London and Globe Corporation.

The fact stands out clearly that both the London and Globe and the British America Corporation were making transactions on paper only, and were, together with the Standard Exploration Company, using their cash and assets in gambling in shares on the Stock Exchange.

The only point directly affecting us here in Canada is the cloud and disgrace which has thereby unjustly been attached to British Columbia, and all Canadian properties, in the London market. There is no reason whatever why British Columbia should be introduced into this stinking mess of company promotion and finance It is one of the points of the English trader to damn a whole country because one of his number has played a rascally game in which some of the counters used were from British Columbia. So far as the interwoven English companies in this affair are concerned their counters might just as well have been marked Kamtschatka or Borneo as British Columbia. We are thankful that there is a London and British Columbia Gold Fields Limited with a reputation which should, partially at any rate, offset the disgraces of the Whittaker Wright outfit.

OUR ILLUSTRATIONS.

The Rock Lake Mining Company.

Our illustrations this month reproduce some excellent photographs illustrating the important copper mining operations being carried on by the Rock Lake Mining Company in the Township of Aberdeen, near Bruce Mines, Province of Ontario.

The company was organized in March, 1899, under charter from the Ontario Government, and has a paid up capital of $3,000,000 in shares having a par value of $10.00 each, and it is directed by a board of officers comprising; Mayer Wile, Bnffalo, N.Y., president; Henry Weil, New York, vice-president; Lawson C. Holden, Sault Ste. Marie, Mich., secretary; Byron G. Coryell, Chesaning, Mich., treasurer; Arthur S. Burrows, Bruce Mines, Ont., general manager.

The mining property held by the company comprises about 1,550 acres. The vein worked has an average width of from 17 to 46 feet and carries copper in the form of chalcopyrite, bornite, and in places some black oxide.

The main shaft has been sunk for a distance of 425 feet. It is divided into three compartments—a manway and two hoisting compartments; one hoisting compartment being fitted with guides for a kibble cross-head and one fitted up for a cage. The shaft is well trimmed up and securely timbered. Three levels have been driven 100 ft. apart.

The character of the ore may be gathered from the following analyses of average samples :—

1st	Level	and	cross-cut	average	7.28 p.c.	refined copper to the ton.
2nd	"	"	"		3.86 p.c.	" "
3rd	"	"	"		2.35 p.c.	" "

An up-to-date mining plant including duplex Rand ten-drill compressor, hoisting engine, etc., is in place, and a mill having a capacity to crush and concentrate 200 tons per day has been installed, the machinery being furnished by the Jenckes Machine Company of Sherbrooke, Que. The ore from the mine is dumped in storage bins, from which it is fed by gravity into a 20 x 30-inch Blake crusher, the product all passing to a revolving trommel of 1 inch mesh, the oversize going to a set of belted 16 x 30-inch rolls provided with ball and socket bearings. From these rolls the ore is elevated to the trommel mentioned above. From the trommel the ore passes to four sizing screens 7/16, 5/16, 3/16 and 1/16 inch. The oversize from the screens is fed to jigs with parallel motion plungers. The last screenings from the finest screens are fed to a settling tank to be treated on finer jigs. The middlings from jigs are crushed in another set of 16 x 30-inch rolls and elevated to the set of four sizing screens mentioned above. The tailings from jigs are fed to a set of high speed 6 x 48-inch rolls, then elevated to a settling tank and after having been sized are fed over Wilfley tables. Concentrates from jigs and tables are settled in large bins. Adjacent to mill is an engine and boiler house 38 x 64 ft. in which are installed a 250 h.p. tandem condensing Corliss engine and three 80 h.p. tubular boilers, the power plant being designed to furnish power not only for the present concentrating mill and electric lighting plant but also for a largely increased mill for which provision has been made.

Accessory plant consists of a brickyard equipped with a pug mill and an improved Martin brick machine having a capacity of 10,000 bricks per day. This is located one mile west of the shaft. A sawmill is also erected adjacent to the brick yard. In order to ship the concentrates from the mine to navigable water in Lake Huron the company has organized the Bruce Mines and Algoma Railway Company, Limited, and will construct the line as far as Bruce Mines in the near future.

PROMINENT CANADIAN MINING MEN.

PROF. WILLET G. MILLER,
Whose candidacy to the vacant Chair of Geology at Toronto University is endorsed by Canadian mining men.

S. F. PARRISH, M.E.,
General Manager of the B.C. Chartered Company, at Eholt, B.C.

E. NELSON FELL, A.R.S.M.,
Mining Engineer in charge of the Athabasca Mine, Nelson, B.C.

G. F. RANSOM,
Sandon, B.C.
In charge of the Slocan Sovereign Mines Co.

E. A. SJÖSTEDT, M.E.,
Metallurgist at Clergue Works, Sault St. Marie, Ont.

D. W. ROBB, M.E.,
Of the Robb Engineering Co., Amherst, N.S.

The company also owns a valuable asset in the water power of the Thessalon River from which can be generated electric energy more than sufficient to operate the entire mining and milling plant. The company employs at present over 300 persons.

Gold Dredging on the Saskatchewan.

The North Saskatchewan has hitherto been by far the most important stream upon which gold mining operations have been carried on, and is the only one which has offered a continuous and somewhat considerable output of gold. The length of the river upon which work has been found to pay, under favorable conditions, is, as already defined, about 120 miles; Edmonton being situated almost in the centre of this length of the river. Up to the present time, gold washing has been prosecuted almost entirely by hand or with the aid only of very rude mechanical appliances for lifting small quantities of gravel from the submerged bars and bed of the river. The prosecution of this work has been desultory, being practically limited to the low-water stages of the river, and even then conducted by a number of men who, generally, wish to devote only a part of their time to such work, influenced largely by the inducements offered by employment in other directions. It must be added, however, that experience here as elsewhere in regard to river-bar mining, shows that the best returns are obtained from the first working of such bars, and that, although more or less re-arrangement of material and renewal of accessible gold is brought about each year when the river is in flood, the naturally exposed bars rapidly deteriorate in their yield. For this reason, except at unusually low water, a number of the miners now devote themselves to the working of layers of gravel covered by lighter sandy deposits along the banks of the river, and that these often carry a considerable amount of gold is shown by the fact that some men were engaged with profit, during the past year, in removing from five to eight feet of sand, shovelling underlying gravel from the pit thus formed, wheeling it thirty or forty yards to the edge of the river, and washing it there by hand with an ordinary "grizzly."

A number of dipper dredges of varying construction have been working successfully for a number of years on the river, but these have lately been supplemented by dredges of the New Zealand type built for the Saskatchewan Gold and Platinum Proprietary, Limited. The dredges of this Company, after having undergone some improvements in their gold-saving appliances, are reported to be yielding highly successful results. Other dredges are contemplated, notably by the North-West Dredging Company, which controls the mining rights over some 60 leases covering some 300 miles of the bed of the Saskatchewan.

There appears to be no reason to doubt that satisfactory results comparable with those achieved in a number of cases in New Zealand may be obtained on several rivers in the North-West, and more particularly on the North Saskatchewan. Properly constructed dredges of adequate size and capacity will permit work to be carried on continuously during about half the year. It is to be remembered that such dredges enable the working not only of the bars and bed of the river, but also of the adjacent river-flats, where these do not possess a greater and more permanent value for agricultural occupation. Many of these flats are known to be underlain by auriferous gravels which have never yet been touched.

The Paradise Mine, Windemere, B. C.

Mr. R. Randolph Bruce, B.Sc., whose portrait is reproduced in another page, is one of the most genial and deservedly popular of the mining men in British Columbia, and is well known, particularly in East Kootenay, as the successful manager and part owner of the Paradise Mine, located in Windermere District. Particulars of the progress of development of this property have appeared from time to time in the REVIEW, but the following description by Mr. Chas. F. Nicholson, Assayer, of Peterborough, B.C., given in the last issue of that excellently conducted publication, the *B. C. Mining Record*, will be of interest to many of our readers:—

"The Paradise Mine, in the Windermere District of East Kootenay, was located in August, 1899, and bonded in June, 1900, to Messrs. H. C. Hammond, Toronto, and R. Randolph Bruce. What is now No. 4 tunnel had been driven some seventy feet during the winter of 1899-1900, but development work proper was not commenced until June 11, 1900. By the following March, nearly 1,000 tons of ore had been conveyed, for the first five miles from the mine, by rawhide, thence eleven miles by sleigh to the Columbia River at Peterboro. In the spring, upon the opening of navigation, the steamer Duchess conveyed the ore to Golden, whence it was shipped to the Trail smelter *via* the Canadian Pacific Railway. A remarkable feature of this achievement is that the product was taken from the mine by pick and shovel. Not a stick of powder was used.

The mine is reached from Peterboro, on the Columbia river, by a wagon road constructed by the Government in the summer of 1900, and follows the valley formed by Toby Creek. This wagon road was one of the first constructed under the direction of the newly created inspector of trails and roads. The heaviest adverse grade against them is 2 per cent., but it is for a short distance only. The road is an excellent one in every respect. From Toby Creek to the basin in which the Paradise is situated, a good rawhide trail was constructed. The grade of this trail for a great part of the distance is 110 to the mile. It is well constructed and answers all purposes for taking in supplies and bringing out ore.

The development work on the property consists of three tunnels. No. 1 tunnel is in the ore chute from which the shipment was made. The ore consists of a friable substance which reacts for lime with acid, and is readily distinguished as pay dirt by its specific gravity. The pay dirt has been given the name "Sand Carbonates" and carries as a usual thing about 50 per cent. lead and 60 oz. silver. In this district the dip of the strata is to the west, and the strike north 20° west, magnetic. On the summit of the mountain on which the Paradise is located and about 1,000 feet from the workings, the dip and strike of the upturned strata is as stated. But in the different workings on the Paradise the dip is shown to be northward and the strike east and west. The ore body is between a contact of slate and lime, and has a dip of 35 degrees. A tunnel was driven in for 30 feet in the ore which at that point was encountered in considerable body. About 500 tons of ore was sacked from this deposit. The pay dirt was found to lead from the north side of this deposit and has been followed by an inclined shaft for 180 feet at an angle of 35 degrees. The floor of this incline is the footwall and the roof the hanging wall. That is, it is assumed that the floor is the footwall, for as a matter of fact the hanging wall has been followed closely and as the timbering is in ledge matter, it is assumed that the ledge may be wider than the excavation on the incline shows. No work has been done to establish that point. At one point only was the excavation made wider than required. At that place the incline was widened to probably 20 feet. The first ore was sacked in September of last year and all the ore with the exception of about two tons, comprising the shipment to the smelter, came out of the deposit of "Sand Carbonates."

No. 2 tunnel had been driven at the time of my inspection in August, 182 feet. It is 125 feet vertically below No. 1 tunnel but some little distance to the east, and is a cross-cut to the lead. The

COPPER MINING IN ONTARIO.

Rock Lake Mining Co., Bruce Mines, Ont.—General view of Works, Clubhouse, Boarding House, Shaft House, etc.

Rock Lake Mining Co., Bruce Mines, Ont.—View showing Concentrating Mill from East side.

management is of the opinion that the paystreak between the slate and sillicious lime, will soon be reached. It is the intention to then drift 500 feet which will bring them under the ore shoot in No. 1 tunnel.

No. 4 tunnel is the oldest working on the property and with its cross-cuts and drifts, aggregates 526 feet of work. This tunnel is in a ledge which development has demonstrated to be 40 feet wider. About 300 feet from the entrance a cross-cut was made when ten feet of concentrating galena was encountered. The ore taken out in tunneling through this shoot was sorted and ten tons sacked and sent to the smelter. The ledge matter is well oxidised. Originally it was probably carbonate of iron with stringers of galena. In tunneling stringers of galena were encountered at frequent intervals. Further cross-cutting may discover other ore values similar to that mentioned. No work has yet been done to determe the extent of the ore body referred to. At present the extremity of the tunnel is in a very hard rock seamed with small fissures of quartz.

The theory of the best authorities who have examined the property is that the deposit of so-called "Sand Carbonates" was originally galena. Nuggets of galena were encountered in the workings enclosed in concretionary rings of high grade carbonates. There are indications that the "Sand Carbonates" is a V shaped trough but as already stated the deposit has not been sufficiently explored to show its nature and extent. It is a conundrum that can easily be solved by continued development and investigation.

For a few months following ore production from the mine work was suspended. But in August the manager, Mr. Bruce, resumed operations, Mr. J. J. McMullen, an experienced mining superintendent being placed in charge of the work. The present quotations on lead and silver do not offer an inducement to take out ore for shipment under conditions of present freight and smelter treatment charges but provision is being made for the continuation of development for a year's operations it being the intention of the management to thoroughly exploit the property and solve the problem of the somewhat remarkable ore occurences.

The smelter returns give about 50 per cent. lead and 41 of silver, which the cost of mining has been comparatively light, the transportation and smelter charges are such that the margin of profit is small. Although the ore, with the exception of the small quantity of galena, is free from sulphur, the best freight and treatment quotation that could be obtained from the smelter was $19 per ton from Golden. The cost of transportation from the mine to Golden was about $9 per ton.

With the exception of two cars of $150.00 ore shipped from the Delphine mine in the spring of 1900, the shipment from the Paradise mine was the first from the Windermere district. The Macdonald mine formerly known as the Red Line, will, it is stated, ship several thousand tons this winter. A wagon road is now in course of construction to that property.

Arsenic Refining in Ontario.

Repeated mention has been made of late in the columns of the REVIEW of the successful work in exploiting the auriferous mispickel ores of the Hastings district, Ontario, being carried on by the Canadian Gold Fields, Limited, under the able direction of Mr. P. Kirkgaard. The group of views shown in this issue give a very comprehensive idea of the surface works of the company. During last year 606,000 lbs. of arsenic of an estimated value of $22,725 were produced by this company as a bye product of their gold milling operations. These are the only arsenic refining works, we believe, on the American continent.

New Furnaces at Sydney, Cape Breton, of the Dominion Iron and Steel Company.

The furnace plant shown in our photo were erected by the Ritter-Conley Manufacturing Company of Pittsburg

The stacks are 20 feet in diameter at the bosh and 85 feet high; diameter of the hearth, 11 feet 9 inches; at stock line, 14 feet 6 inches; there are (12) twelve 6 inches tuyeres. Each furnace is provided with Julian Kennedy's patent top filling apparatus. The furnace shell is 28 feet in diameter and 23 feet at the top of the furnace. Bustle pipe surrounding columns 46 inches in diameter. Tuyere stocks 12 in number, of improved type with ball joints and adjustable blow pipes. Skip hoist leading from under stock bins to top of furnace is of structural steel and carries two skip cars which rest at the bottom in a steel cased pit. The stoves are of the Cowper type with casing 21 feet in diameter by 85 feet high. Stove chimneys are 9 feet in diameter inside lining, 200 feet high, provided with heavy cast iron bases, bolted to foundation. Boiler house is 53 feet wide, 576 feet long; steel building with brick walls; heavy concrete foundations; contains 8,000 h. p. boilers, with two steel stacks one for each 4,000 h. p. boiler. The boiler stacks are of steel 11 feet inside diameter of lining, and 200 feet high; boilers connected to these stacks by overhead breeching. The boilers are of the Babcock & Wilcox type amply strong for working pressure of 150 lbs. to the square inch.

The engine house is 44 feet 2 inches span, 200 feet long, contains five pairs of blowing engines built by the E. P. Allis Company; and commanded by 1 30-ton electric overhead travelling crane. These engines each have high pressure cylinder, 50 inches diameter, low pressure 96 inches diameter, with blowing tubes 96 inches diameter, all of stroke of 60 inches.

The pump house which is a lean-to on the engine house, is 30 feet span, 200 feet long and contains three horizontal Wilson-Snyder compound direct connected circulating pumps having steam cylinder 18 inches and 32 inches diameter, bronze plungers 24 inches in diameter by 36 inches stroke. Pumps are each rated at 6,000,000 gallons per 24 hours. All pumps are connected to an exhaust line extending to the end of the engine house with connections leading to the condenser system. Provision is made for the connection of a fourth pump if desired. These pumps obtain their water from the harbour and are connected to a 20 x 85 feet stand pipe which supplies water for circulating and cooling purposes.

The pump house contains a pair of surface condensers built by the Northey Mfg. Company of Toronto. Through these the return water from the furnaces is used for condensing purposes.

Fresh water supply line leads to the wall of the engine house and has connection to the boiler feed pumps which are three in number and are duplex outside packed plunger type, 14 x 9 x 18 inches stroke; these were built by the Wilson-Snyder Mfg. Co. of Pittsburg, Pa. A valve is placed on the fresh water line for connection to the main salt water well and to the salt water discharge line from the pumps, enabling the use of fresh water in case of emergency for cooling purposes. To the Northey condensers in the pump house there is a connection leading through the wall to a line to the electric power station.

The Generator equipment consists of three 500 K. W. electric generators built by the Canadian General Electric Company, each driven by a cross-compound condensing engine with cylinders 20 inches and 40 inches diameter, 42 inches stroke, speed 90 revolutions, built by Laurie Engine Co. of Montreal.

The building which is 51 feet 3 inches span by 130 feet long is of steel with brick wall filling; the structural work was furnished by

COPPER MINING IN ONTARIO.

Rock Lake Mining Co., Bruce Mines, Ont.—View of New Concentrating Plant.

Rock Lake Mining Co , Bruce Mines, Ont.—View showing Concentrating Mill from the West.

GOLD DREDGING ON THE SASKATCHEWAN.

Rock Lake Mining Co., Bruce Mines, Ont.—Showing Railway to Concentrating Mill.

Saskatchewan River looking North, showing Gold Dredge at work.

GOLD DREDGING ON THE SASKATCHEWAN.

Washing Gold with a Grizzley on the Saskatchewan.

Dredge under construction on the banks of the Saskatchewan, N.W.T.

GOLD DREDGING ON THE SASKATCHEWN.

Showing the type of Dredge working on the River.

ARSENIC REFINING IN ONTARIO.

Showing Mill, Refinery and Mine Buildings of the Canadian Gold Fields, at Deloro, Ont.

STEEL-MAKING IN CAPE BRETON.

DOMINION IRON AND STEEL COMPANY, SYDNEY, CAPE BRETON.

View of New Furnaces, Skip Hoist and Bins.

the Dominion Bridge Company of Montreal. The electric machinery is commanded by a 15-ton crane, also designed and built by the Dominion Bridge Company. The switch-boards, booster and electric appliances, all of the latest type and the entire equipment of the electric power station was furnished by Canadian manufacturers.

The metal from the furnaces is taken in 25 ton ladle cars to a motor-driven pig-casting machine, which was built by the Heyl-Patterson Company, Pittsburg, and which has a capacity of 1,600 tons per 24 hours. Or hot metal may be taken in the ladle cars direct to the open hearth furnaces which are as above stated 10 in number and of 50 tons capacity. They are of the tilting type. These are arranged in continuous rows, metal may be poured into the furnace from pouring side or cold pig and stock may be placed in the furnaces by two Wellman-Seaver charging machines.

The product of the furnaces which is estimated at 1,400 tons per day, will be tapped into 50 ton ladles from which it is poured into the moulds on cars and transferred to the stripper building where moulds are removed and ingots deposited in the pit furnaces. Open hearth building has span of 65 feet with lean-to 37 feet wide, 832 feet long.

The gas from the open hearth will be partly from producers of the latest improved type and partly from the coke ovens. A 1,000,000 cu ft. triple lift gas holder is located adjacent to the furnaces and is so constructed as to give a working pressure of 5 inches column of water.

COAL MINING AND TRADE.

Another of those terrible calamities which seem to be inseparable from coal mining at the Coast occurred in the recent explosion in the Extension mine belonging to the Dunsmuir Company. It is recognized among mining experts that all coal mines in the Cretaceous formation are peculiarly liable to accidents of this kind owing mainly to the tender and friable character of the coal, its dry and dusty nature and the large quantity of gas which the seams of the new formation contain. Here we have a combination which is both difficult and dangerous in the highest degree and if to this be added the irregularity in thickness of the seams, which often vary from two feet to ten or twelve feet in thickness and the consequent difficulty of maintaining uniform airways and roads, it will be seen that the mining engineer who has to cope with these conditions enjoys no sinecure. What impresses one most is that in spite of the remarkable strides which have been made of late years in elucidating a coal dust theory and the vast improvement made in the equipment of all well regulated mines, explosions, at any rate at the coast and in similar mines, do not appear to be less frequent. This is a matter which demands serious consideration and can probably only be explained on one of two grounds. First, the carelessness of the miners themselves who have been the cause of many of the most disastrous explosions, through tampering with their lamps, and secondly, the much larger areas which are sought to be recovered from a single winning in coal mines of to-day. The former is a matter in which little or nothing can be done beyond exercising the strictest supervision and endeavoring to impress upon the workmen themselves how heinous is the offence of the man who interferes with the very means which are provided to insure his own safety and that of his fellow workmen. Indeed it is largely a matter of education, and we have no doubt that as miners become more enlightened and especially as they are made better acquainted with the character of the forces with which they have to deal, they will gradually become more careful and thus one of the most prolific causes of explosions will be greatly modified. The other matter is one which will have to be considered upon a different basis altogether. In the endeavor to develop large mines and secure a maximum output from a single shaft there is no doubt that of late years the areas sought to be recovered have been greatly increased until it is more than doubtful if they do not exceed the safe limit. This subject was fully discussed in the Old Country a few years ago and practical men were anxious to induce the government to include in the "Mines' Regulation Act" a clause limiting the area which could legally be worked from one winning. This was defeated by the mine owners, who claimed that with the improved appliances now in use and the large amount of capital being expended upon mines, it was possible to secure absolute safety so far as ventilation was concerned for a larger area than any yet attempted, and so the matter fell through, but in the opinion of the best judges it was thought then and is still believed that there should be more frequent openings to the surface when large areas of coal are being recovered and while the practice of to-day, calling for numerous splits in the air is a great advance upon the old theory of a single current, there is a limit to the efficiency of even this improvement and in any case it is greatly impaired by the enormous distance which the air has to travel in some of our modern mines. If instead of bringing the return current back to within a few feet of the point from which it started, there were another shaft at the extreme end of the workings it would be far easier and safer to ventilate a large mine. It will be seen that the question thus resolves itself into one of economic conditions and if it is a question of capital outlay as against the safety of the workmen we have no doubt as to what the result will ultimately be. If, however, to the advantage to the workmen which would accrue from the methods suggested, we also add the greater immunity from danger which the property of the mine owners would enjoy, it seems to us that the argument is unanswerable and that on all grounds it would be well that this matter should receive the most careful consideration, not only of mine owners themselves but of all whose duty it is in any way to regulate the conditions of mining in the interests of the workmen as well as of capitalists.

The full discussion of the subject of an export coal trade for Canada which has taken place in these columns has attracted general attention and has stimulated the efforts of our Nova Scotia friends to investigate the conditions of the coal market in Europe. The Dominion Coal Co. have sent their assistant manager to the Old Country to open up negotiations for an English trade and in addition have already shipped several carloads of coal to Norway. It is not necessary for us to go over the ground again as doubtless our readers who were interested in the subject, will remember that in thoroughly threshing out the matter we arrived at the conclusion that there is a market in London alone for 2,000,000 tons of Nova Scotia coal a year if the same could be laid down at about 14s. a ton, and as the shipping companies had offered to undertake the transportation of a large tonnage for $1.50, this would leave $2.00 for the coal f. o. b. Cape Breton, a price upon which a handsome profit could be made. We sincerely hope the efforts of the D. C. Co. may be successful as we are convinced that if a trade is established there will be no difficulty in holding it, but it would be a mistake to quote the present f. o. b. price as the only possible chance of holding this market, is at a comparatively low figure. It is true the D. C. Co. have almost ruined themselves by selling to the Everett Gas Co. at about $1 25 but there is no reason why $2.00 should not be considered a satisfactory and remunerative price. In addition to the English market, which we think will lie chiefly in the Thames, there is no reason why the Mediterranean should not be largely supplied with Canadian coal. The greatest obstacle to overcome will be the fact that all around the

Mediterranean coast, briquettes are used very largely in consequence of their greater cleanliness and portability, and we yet hope to see the manufacture of this commodity established on a firm basis in Nova Scotia, as we are satisfied that it would solve the problem of a large export trade not only with the Mediterranean but with the West Indies and South America. No doubt the reason that the matter has been allowed to stand over is because at present there is a market for all the fine coal which is being made and this will continue so long as the coke ovens of the Dominion Iron and Steel Co. are not fully supplied but there will ultimately be a surplus which could not be treated more profitably than by this process. The *Maritime Mining Record*, which is well posted on the coal trade of Nova Scotia, admits that our contention of a few months ago to the effect that a new market would have to be sought for any coal produced by the Dominion Coal Co. in excess of 2,000,000 tons a year, is already verified, and in view of the considerable development also being made by other companies it becomes more than ever a matter of absolute necessity to establish an export trade.

We notice from an Eastern paper that the D. C. Co. contemplate installing electric haulage in their new mines. This is a matter of interest because of the remarkable success which for the last eight years has attended the use of endless rope haulage by this company, and although no doubt they would be governed by the best obtainable advice in any change of this kind which they may institute, we doubt whether the conditions prevailing in Cape Breton are so favorable for the use of electric haulage as of other systems. The reason for this is that their mines are all on a slight grade, varying from 5 to 7 per cent. and with a load and the grade against the load it is doubtful whether any system is as cheap or efficient as endless haulage. Certainly not where a large tonnage has to be hauled up main deeps. Upon a dead level or a very slight grade, electric haulage is all right and can be seen in satisfactory operation at many of the largest mines on the continent. It is therefore useful upon the levels and side roads of a mine but owing to the large amount of power which would have to be generated it is certainly not as economical upon the main deeps. Where all the coal rises to the crop as in mountainous districts or at any rate where the winning is to the crop for many years, it is a totally different proposition, as in that case the main entry is on the level and with all the roads running to the rise the system of electric haulage is easier and cheaper. With the deep works however which prevail in every mine of the D. C. Co. it is doubtful whether the present system can be improved upon. The experiment, if made, will be watched with interest by all practical miners.

The *London Intelligence* has compiled from official records the following statement of minimum and maximum average calculated values of coal at the pit's mouth in different countries for the last eighteen years.

	Minimum		*Maximum*		*Range*	
Country.	S.	D.	S.	D.	S.	D.
United Kingdom..	4	9¾	10	9¾	6	0
United States.....	4	5	6	5½	2	0½
Germany.....	5	1¾	8	10	3	8½
France.....	8	3¼	9	11¾	1	7½
Belgium.....	6	5¼	9	11¼	3	6
Spain.....	5	7½	8	10¾	3	3¼
Austria.....	4	10	6	6¼	1	8¼
Hungary.....	7	9¼	9	0	1	10¾
Japan.....	5	11¼	8	9½	2	10¼
British India.....	3	8½	5	2¾	1	6¼
New South Wales.	5	5	9	6	4	1
New Zealand.....	10	0	11	4	1	4
Queensland.....	7	1	10	1	3	0
Victoria.....	8	6	28	0	19	6
Natal.....	8	6	12	0	3	6

From this, one or two very striking lessons are to be learned. First, that the two greatest coal producing countries in the world—Great Britain and the United States—are also the producers of the cheapest coal, the exceptihn being British India, where the low cost of production is due to employment of Coolie labor. Another very important feature is that the fluctuation in the price of coal in the United States is less than in any other country, a feature upon which too much stress cannot be laid, as cheap fuel with limited fluctuation in price is undoubtedly the keystone upon which commercial success is built On the other hand the extreme fluctuation in the price of coal in Great Britain explains why the Old Country is subject to alternate periods of extreme depression and extreme inflation of trade, all of which goes to show that if Canada is to become a large industrial country, especially to compete with the United States, as seems inevitable since they are our nearest competitors, we shall have to strive for the ideal condition which prevails there in respect to this most important matter. It is further obvious that here is an important pointer with respect to our export trade, for while it would be easy to export coal to Europe when the average selling price of British coal is in the neighborhood of 10s. it will be a very different proposition when the price gets down towards 5 or 6s. as it undoubtedly will in times of depression and this is why we contend that the wisdom of the Canadian producer would be shown in endeavoring to secure long time contracts at moderate prices, otherwise by the time we had established a trade and made all necessary arrangements for transportation we might find that the price of the British commodity had fallen so low that we should be cut out. We commend this to the careful consideration of Canadian exporters who are seeking to build up foreign trade.

The visit of Sir Christopher Furness to this country may have important results in the near future, especially as he has come on the invitation of such inflential men as Sir Wm. Van Horne and Mr. H. M. Whitney. What the ultimate result will be it is impossible to tell but owing to the important associations of Sir Christopher in the Old Country there is no doubt that he is able to carry into effect any scheme which meets with his approval. There are two ways in which his vast influence may be used to benefit Canada. The first and probably more immediate object of his visit is to consider the possibilities of coal transportation across the Atlantic, but we are loth to believe that nothing more than this may follow, and without being too optimistic we should not be surprised if the long cherished hope of a line of steamships between Sydney and some British port is not shortly to be realized. With 25,000 tons of steel already exported to England and with the prospect of continuous coal exportation there is surely plenty to justify the serious consideration of such a scheme, especially as under the preference tariff the exportation by English manufactures of their products, is steadily increasing. There is no reason why, in many of these staples, there should not be a steady return trade. Of course so far as the Furness line is concerned their action would probably be dependent upon this, as they run mixed cargo boats and would hardly be likely to entertain an export trade only. If the day comes when a large export coal trade is established in Europe, we are convinced that the ultimate solution of transportation lies in fast coal boats running directly between Cape Breton and European ports, specially designed for the trade, returning light, but that stage has not yet been reached and there is room for an arrangement with such a line as that controlled by Sir Christopher Furness, at any rate in the earlier stages of the trade.

Great activity is noticeable in the Crow's Nest Pass, both in connection with railway construction and coal mining. The Great North-

ern have over 2,000 men at work constructing their line from the International boundary by way of Elko to Fernie. The line is located throughout and the right of way is now being burned. The contract calls for the completion of this branch, which on Canadian territory will be about 80 miles in length, by the end of 1902. After crossing Tobacco Plains the line intersects the Crow's Nest Pass line at Elko and proceeds up the west bank of the river Elk to Fernie, where it crosses to the east bank and is continued up Coal Creek to Fernie mines. This will give two outlets for coal, by the C.P.R. and G.N.R. A branch is also being built up Morrissey Creek which will connect with the Crow's Nest Railway to serve the mines located there. At the mines, under the management of Mr. Thos. Stockett, who has just come in as engineer to the Great Northern Railway, every effort is being made to develop the capacity to something like the tonnage which the American market requires. Mr. J. J. Hill's demand is for 10,000 tons daily, and as the present capacity of the mines at Coal Creek and Michel only reaches 1,200 tons a day, there is a very large margin to fill. Meanwhile, in order to supply this deficiency, the Great Northern have made offers for the coal produced in the Blairmore district. At present the only mine operating here belongs to Messrs. Frank & Guibault, with a capacity of 200 tons a day. It was thought this mine would shortly yield a large output, but the results are very disappointing, as the coal appears to have no depth, being located on the side of a limestone mountain and so subject to interference that its continuity is doubtful. Other properties, however, are being opened up and will soon be ready to ship coal. In view of the development which is likely to take place in British Columbia in the near future and the increased demand for coal, it is to be hoped that the C.P.R. will shortly operate the coal areas which they have acquired in the Pass, for with a total production of 1,200 tons daily after four years' operation, it is certain that the Crow's Nest Pass Coal Co. will for years to come be totally unable to supply the demand even if they confine themselves to Canadian trade, but with Mr. J. J. Hill in control of their stock, building railroads as fast as he can in order to supply the American market, it is certain that British Columbia will run short unless further provision is made. In this connection it is gratifying to notice that the result which we have always predicted in the event of competition in Crow's Nest coal, is already being realized, for the opening of the Blairmore coal field has given the public good screened coal at 30 per cent. less than the price charged by the Crow's Nest Coal Co., and it is confidently asserted that the coke which they will shortly put upon the market will be sold at $3.50, as against $4.75, the price charged by the above company. In coal production as in railway transportation there are some advantages in competition, and in view of the continual lowering of the standard value of B. C. ores, the urgent necessity for cheap fuel becomes more apparent every day.

The Progress of Mining and Metallurgy.*

By Dr. James Douglas, New York.

If we go back a little more than half a century to 1840, when the first industrial census was made, we find that there were scattered throughout the length and breadth of the land, from Maine to the wilderness of Wisconsin, 804 iron blast furnaces, making 256,100 tons of pig iron or one pig per diem per furnace and 796 bloomeries and forges, making small quantities of wrought iron direct from the ores, or converting some of the pig into malleable iron. These little furnaces and bloomeries and forges were not worked by trained metallurgists, but by farmers and back-woodsmen, who had to produce a local supply of iron, owing to the distance from a market and the difficulty of transportation, and who, wherever there was wood from which to make charcoal and water to give them blast, and a small or large deposit of rich iron ore, employed that mechanical ingenuity, self reliance, and adaptiveness which have always been such marked characteristics of the American character to supply their wants. They were not in any sense educated metallurgists, but they possessed that same spirit which has converted into shrewd geologists, of a rough and ready type, and into skilful, practical, if not theoretical, metallurgists, hosts of men from every walk of life who have drifted from the East across the Missouri, and become, as prospectors, the pioneers and real developers of our Great West. And had it not been for the infusion of this same temper into the builders of our magnificent modern metallurgical establishments, we would not be setting the pace to the world to-day. Had our Fricks and Thompsons and Carnegies been willing only to follow precedents and foreign tradition, and had they been hidebound by the teachings of the schools, our output of iron and steel would not stand first on the list of the world's production. But even as the backwoodsman of the early decades of the last century turned from his plow and his axe to make iron in his own way, so our great iron masters, not being hampered with overmuch reverence for the past, have fearlessly expanded their furnaces, applied new mechanical contrivances, enlisted electricity, and in many other ways applied the inventions, which they have been willing enough to accept from abroad, on expanded and often new lines.

Looking at the field of mining and metallurgy to-day, the prominent features of our progress have been, first of all, the large scale on which we work, and secondly, the very extensive use of machinery, which is a necessary concomitant to large production and extensive operation. The large scale on which our continent is built and the corresponding size of its natural resources have unquestionably stirred the immagination of the people and excited their energies. It is true that had we not possessed the natural resources, we could not have made the progress, but there are other peoples who have possessed resources and allowed them to lie idle. Whence, therefore, our success? I think it is due to the mechanical instinct of our people which has always driven them to use their wits rather than their hands, and therefore to apply machinery to all the arts of life—whether they be large or small, wherever possible. The high average cost of labor has made the use of machinery a necessity, even when working on a small scale, and has thus coincided with and stimulated the national instinct. And once machinery supplants hand labor, the impulse to work on a large and ever larger scale is irresistible. The Yankee after all has been the creative genius of our continent, and we are all indebted to him for the infusion of some of his characteristics. Now, the orignal Yankee was a mechanic and turned his talent to making wooden nutmegs and wooden clocks. He continues, as a mechanic, to make clocks, but it will probably be a German chemist who will make artificial nutmegs. The result of this Yankee infusion is that, as a people we are more given to mechanical contrivances than synthetical chemistry.

Among the mechanical factors which have helped to create our existing metallurgical industry, the railroad must be placed first. Through its agency, and aided by the steamer, ores can be brought to fuel, or fuel to the ores, and through this concentration of crude material at favorable localities, works of greater magnitude can be erected, than the supply of crude material in any single district could feed. The formation of our continent facilitates not only the construction and equipment of railroads on a large scale which minimizes both original outlay and operating cost, but permits of the adoption of changes in obedience to the demands of progress, in a manner which it would be impossible to imitate in most foreign lands. A train can run from New York to San Francisco without once entering a tunnel or losing sight of daylight, and therefore structural changes to meet increased traffic can

*Excerpted from an address delivered before the School of Mines and Metallurgy of the university of Missouri 30th May 1901.

be made with less disturbance than in most other countries. Another advantage which we possess is that the railroads abroad were in great measure built through, or to connect, large and populous cities and running through populous districts, when the art of railroad building was comparatively in its infancy. With us the great expansion of our railroad system has taken place when we had the world's experience to guide us. It has been no small gain to us that our active industrial life really commenced contemporaneously with the advent of the railroad ; that it has been built upon the railroad as a substructure, instead of the railrord serving, as it has done abroad, as a mere adjunct. Taking the railroad as a part of our great mining and metallurgical machine, and looking upon transportation as a mere branch of productive industry, it is interesting to follow, say Lake Superior ore, from the mine back to the mine as steel rail, for by doing so we get a clearer conception of the all important part machinery plays in the cycle of our mining and metallurgical operations. The railroad which connects the Mesaba Range with Lake Superior, and the huge trains in which it is hauled from Bessemer to Pittsburg, are as much mining machinery as the steam shovels by which the softer ores are handled, or the hoists by which the deeper ores are raised to the surface. And once the ore reaches Pittsburg, it is by machinery that it is raised to the furnace top, by magnificent steam blowing engines that the blast is created, by electricity that power is transmitted to every department of the mills from one central power plant ; by machinery, that the liquid cast iron is handled in the mixer between the blast furnace and the converter ; by machinery, that the converter with its fifteen tons of steel is handled with as much ease as a teacup, that the Bessemer ingots are rolled into rails while still hot, that the rails are straightened, cut, loaded on cars, and again returned to the West whence the ore came, without the intervention at any point of hand labor, except as the agent of the brain, in directing these tremendous mechanical and physical forces. To such an extent has labor been eliminated that it is generally understood that every man employed about the iron mines in every capacity delivers four tons of iron ore per day ; and the production of our large steel works to-day represents only about one man power, including the clerical force, to between two and three tons of steel.

Do not misunderstand me. I do not wish to imply that we are the only people that use machinery, or that we were the first to make all these applications of it. Still less that we have been great inventors of great processes. We did not construct the first railroad ; we did not build the first large blast furnace ; we were not the first to apply hot blast to them. We did not invent the Bessemer converter with its beautiful dependance of chemical on mechanical forces. We did not invent the Siemens-Martin openhearth process, nor suggest the basic lining, nor invent the dynamo But we have applied Faraday's great discovery more widely than any of our neighbors. We now build blast furnaces so much larger than theirs that one single Duquesne stack turns out annually as much as the 804 little furnaces did per diem or per annum in 1840, and we drive our furnaces at a greater speed even—though we shorten theirlives. We get more blows out of our converters, and more work out of our rolling mills. We con do all this, not because we understand better than our rivals the law of electricity, or have studied more accurately the chemistry of the blast furnace, but because nature has supplied us with an abundance of material to work upon, and because we live up to the principle, which after all is not a contradiction of the old maxim that, whatever our wits find to do we do with all our might.

The same is true in the metallurgy of other metals. The invention of all others which has helped in the development of our copper resources—the adoption of the pneumatic method in modified converters —was worked out abroad, not here ; but for one ton of Bessemer copper made elsewhere we make 100 in this country. So likewise the electrolytic method of refining copper was proposed, used and substanially perfected in Europe, but works are considered there of large size which will turn out 10,000,000 pounds a year of refined copper, whereas we have more than one with a capacity of 100,000,000 pounds.

In all these instances our progress has been mainly due to the employment of mechanical and physical forces as auxiliaries to chemical and metallurgical processes to a greater extent than our rivals ; and therefore I feel as if it were superfluous to even argue that a knowledge of mechanics and physics is as absolutely necessary to the miner and the metallurgist as an acquaintance with mineralogy or the principles of chemistry and metallurgy. I use the word "physics" in its widest sense. Familiarity with the laws of heat is essential if we would use economically steam or hot air as motive powers. Electricity is doing our work under ground and above ground ; striking our drills ; cutting our coal ; propelling our cars ; pumping our water ; hoisting our ore ; moving our machinery in every department, generating heat for the decomposition of our more infusible chemical compounds ; decomposing our solid and liquid compounds in our many electrolytic operations ; transmitting the power from localities where it can be cheaply generated to far distant localities where alone it can be economically used ; lights in mines, and works serving our ends and purposes in a hundred ways, but destined, as we learn more accurately and wisely how to use it, to be of still wider service in the future. But not only have we harnessed electricity to our mining and metallurgical machinery, but we use air and water under pressure to an extent that makes it necessary that a mining engineer or a metallurgist, if thoroughly equipped, should be acquainted, not only with the laws, but likewise with the application of aerostatics and hydraulics.

Now, gentlemen, from what I have said you will gather that, as essentials to success as miners and metallurgists you must possess not only a knowledge of what was formerly supposed to be all that was necessary, namely, of mathematics, chemistry, mineralogy and geology, but you must be acquainted also with the fundamental principles and facts of mechanics and physics ; for the educational equipment of a successful miner and metallurgist to-day is as much more intricate than it formerly was as the magnificent steam engine with which he will hoist his ore, is more complex than the windlass or horse-whim, with which the primitive miner worked. As I have always said, without machinery —and machinery of the very highest type, we could not handle the quantities, without which our large organizations could not be supported If we compare, for instance, the 125,000 tons of iron made in 1840 with the 14,000,000 tons made to-day, you have a standard by which you estimate the difference between the past and the present.

But while the applications of the principles of mechanics have alone enabled us to work on such a gigantic scale, the demand for quality has meanwhile become quite as exacting, and quality can be attained only by the application of chemical analysis to the elucidation of chemical laws. As professional men you will have to do, therefore, with the extremes of large masses and extremely minute quantities, the quality of the large mass being dependent upon the presence or absence, and the play of extremely minute quantities, of certain foreign bodies. To determine the existence of these and to explain their effects, you must be more or less familiar with chemistry and its allied branches. Thus if you are to handle ores and metals in bulk, you can do so only through a knowledge of mechanics ; if you ar to secure uniformity in quality, you can do so only through the agency of chemistry. It is not so many years ago that even some of the largest metallurgical establishments in this country worked by rule of thumb, without the aid of a chemist. But since the introduction of the Bessemer process, in which the making of good steel depends on the presence or absence of minute quantities of silicon and phosphorous ; and since the peculiar properties conferred on steel by minute quantities of nickel, magnesium. aluminum and other

metals are being taken advantage of, metallurgical works without a chemist, or a metallurgist without a knowledge of chemistry, has become an anachronism.

Horror at mastering such an appalling volume of knowledge, as would have to be acquired, if all the facts, phenomena and theories of all these sciences had to be packed into the brain of a metallurgist and miner, might well deter any of us from undertaking the task of qualifying ourselves for creditably filling the humblest place in the ranks of the profession. The utmost that we can do is to familiarize ourselves with the main priniciples of the sciences I have referred to, so that when we come to occupy, as I hope most of you will do, prominent positions in our corner of the industrial world, you will at least be able to map out the lines on which work is to be done, and to be able to judge, whether the technical specialists whom you employ, are fit to do the work which you have assigned them.

Notes on some work recently done in the Mining Laboratories of McGill University.

By J. B PORTER, Ph.D., M. Inst. C.E.. Professor of Mining and Metallurgy.

(Being a paper read before the March Meetings of The Canadian Mining Institute introducing certain papers presented by Student Members)

The Canadian Mining Institute and its predecessor in this Province, the General Mining Association of the Province of Quebec, have for many years consistently pursued a policy of giving every encouragement in their power to young men engaged in the study of mining.

Bona fide students of Mining and Metallurgy are admitted to the Institute at a nomial fee as student members, and valuable prizes are annually offered for their competition. The policy is in fact even more liberal than this, for the ordinary meetings have for several years been open to our students regardles sof membership, and it is not now necessary for even the competitors for prizes to join the Institute, although we of course wish them to do so.

The fruits of this policy are to be seen in our Transactions, in which there are a number of excellent papers written by students of one or another of our Mining Schools ; and any one who has attended the meetings of the last two days must have noticed the large number of young men who have been present. Today we have them with us in even greater force than before, and all of our members who are interested in educational work and in the future of our Institute, must be greatly encouraged by these evidences of their desire to listen to our papers and discussions, and to take part, so far as possible, in our proceedings.

In view of this I trust that I may be pardoned if I cast the few words I am about to say, more in the form of an exposition of our methods of teaching than is justified by the title of what our secretary has been pleased to call my "paper". As an additional reason for what I am about to do, I beg to call attention to the fact that the remainder of this session is to be devoted to the student papers submitted in competition for this year's prizes. Surely no professor could have a better excuse for talking "shop."

McGill was the first of the Canadian Universities to institute a regular course in Mining Engineering. This was announced in 1871, and the first graduates were given diplomas in 1873. It is interesting to note that only three Americian Universites preceded us in this matter, Columbia School of Mines in 1867, Massachusetts Institute 1868, and Lehigh in 1871.

At first Massachusetts Institute alone had laboratories and the others—including of course McGill— made no attempt at any laboratory teaching except that of Chemistry and Assaying.

As time went on the others acquired more or less complete mining laboratories, but at McGill the growth was in other directions, and up to five years ago the only mining apparatus available was what my predecessors, Dr. Harrington Mr. Carlyle and Mr. Hardman, had got together with their own hands. It is the more to their credit that, in spite of such meagre facilities, these gentlemen turned out a lot of mining engineers, who have carried the name of McGill well to the front in both Mining and Metallurgy, not only here in Canada, but, as Mr. Bell said last night, in the Uuited States, Mexico and South America, and I may add in Australia and Africa as well.

In the meanwhile not only the Mining Schools in the States had secured equipment, but two strong Mining Schools in Canada (Kingston and Toronto) had developed courses and equipped laboratories.

At last, just about five years ago, Sir William Macdonald turned his attention to our profession, and soon after announced his intention of giving McGill a mining equipment of the first rate.

I had the honor to be appointed the first Macdonald Professor of Mining and Metallurgy, and to me fell the task at once very interesting and extremely arduous of designing a laboratory, securing and installing the apparatus and organizing the methods of instruction.

Laboratory teaching in Ore Dressing and Metallurgy may be of three kinds :

1st. Purely theoretical with small apparatus, requiring methods of work similar in scale to those of the chemical laboratory. Such work is extremely useful, especially in getting at fundamental principles, but if only this type of study is carried on, the student is likely to get a very incomplete conception of his subject.

2nd. Highly practical work on a scale of "almost 12 inches to the foot", as Professor Richards calls it. The best example of teaching of this sort is probably found at the Camborne School of Mines in Cornwall where the school owns a mine and a dressing works, and each student is required to do quite a good deal of real work as a set part of his course.

3rd. A combination method in which so far as possible the good features of the first and second are joined.

We have tried to lay out our laboratories on this third plan, and as we are at last really in working order I may be permitted a moment to explain what we do, or at least try to do, for our students.

I shall not describe the laboratories, for I trust that you will visit them and see for yourselves. Even the members who visited us last year, will find if they come again many additions, especially to the accessory apparatus that is so essential to the successful use of all laboratories, whether educational or merely experimental.

Neither shall I detail our course, which we fully set forth elsewhere, but I may say in this connection that we strive first to ground our men thoroughly in the essentials of all engineering, namely Physics, Mathematics, Surveying, Drawing, etc. We then give them elementary theoretical courses in Engineering, Mechanics, Chemistry, Geology, Mineralogy, Ore Dressing, and Metallurgy ; each course of lectures being demonstrated and confirmed by laboratory work.

After these have been mastered, we have a field school in surveying and a six weeks' summer school of practical mining, which we hold in some one of the large mining districts.

Finally, after all of this preparatory work, we give our men one final year of advanced work in the especial subjects of their profession.

In this year they do their most serious mining laboratory work. First, they witness and to a certain extent help in a stated number of standard operations, a stamp mill-run coarse concentration on jigs, slime concentration on tables and vanners, and a day at each of the roasting furnaces, and several days at the water jacket smelter.

These large tests are paralleled and checked by a number of little runs made by the individual students, who put through complete tests on 50 and 100 lb. lots, using simple apparatus, such as the miner's pan

and hand jigs so far as possible, but when necessary making use of working models of the larger machines.

As soon as these tests are completed, each man is required to take up some one comparatively large problem in ore-dressing or metallurgy and the remainder of the year is devoted to working this out to a successful conclusion.

As an illustration of this final work I may name the following as some of the subjects of the current year :

1. The comparison of different methods of crushing, as affecting the proportion of fines.
2. The losses of value in the different classes of slimes resulting from crushing of various gold and silver ores.
3. The effect of different degrees of crushing and grinding and of other variations in treatment, on the recovery of values in gold and silver amalgamations.
4. The comparison of Wilfley and Frue concentrators on ores of different sizes and kinds.
5. The magnetic treatment of various Canadian ores with a view to their concentration, or the elimination of impurity.
6. The effect of washing on several kinds and sizes of Canadian Coals.
7. The leaching of concentrates and tailings from certain Canadian gold mills.
8. The electrolytic refining of certain metals.

I might extend this list, but enough is given to show the wide choice offered the men and the practical bearing of their work.

In each case, the theoretical side must be worked up, and small scale experiments made, leading to and culminating in one or more fairly large tests ; and it is very satisfactory to note that our equipment is sufficient thanks to Sir William Macdonald's munificence to enable all of these operations and more to be conducted at once without serious interference.

Most of this work results in nothing very startling, for our chief duty is to teach young men the elements of their profession, and there is little time left for advanced research ; but even in this matter of fact work, valuable data are constantly accumulated and occasionally new results and new combinations are obtained. Furthermore, as we get our educational work more and more in hand, we are beginning to find time to do a little experimenting ourselves. This second function of an experimential laboratory is scarcely less important than the first, but must come after it. As time goes on, I trust that we shall be able to make the McGill laboratories of very great value to Science, to the Mineral Industry, and perhaps even to the individual mining engineer. As a mere taste of what may be done, I shall now give some details of a few of the more advanced researches that have been carried out, or are being carried out under my charge.

1. In conjunction with one of the officers of the department of Physics, Mr H. M. Tory, we have experimented on the melting points of gold, silver, copper, etc. and thanks chiefly to Mr Tory and my late Assistant Mr Yuile, extremely interesting results have been attained, especially in the exact determination of high temperatures. Degrees of heat as high as 1100 or 1200 centigrade have been measured and re-measured with an accuracy and ease probably never heretofore attained.

2. The concentration of Molybdenite, which so far as I know has never heretofore been attempted, has been quite successfully accomplished, and a high grade concentrate obtained from very low grade rock by a somewhat unusual series of crushing, jigging and sizing operations. The process is probably not commercially applicable to the particular ores on which we experimented, but might well be used on similar ores occurring in larger quantity or in more favourable situations.

3. The concentration of Chromite. This mineral is valued for its $Cr_2 O_3$ and its price in the markets of the world enhances very much as the tenor of chromic oxide increases, the critical point being 50% in most cases. The concentration of chromite on jigs is an old story, but there are in this Province many chromites which jigging fails to raise above 45-48%. We find that a judicious combination of magnetic separation with jigging or other gravity separation, raises the $Cr_2 O_3$ several percent above the result obtained from either alone, and in the cases of ores which fall below 50% without this treatment, but rise above 50 by means of it, the extra cost will no doubt be more than met by increased values.

In this connection I may say that the late Director of the Geological Survey was very hopeful of valuable commercial results in this matter and a few weeks ago he secured from me a report, which he proposed to print in the forthcoming volume of the Survey. We had planned an extended investigation of chromite ores from various districts, and while I have no doubt that the new head of the Survey will carry out his share of the proposed work, yet I shall be greatly obliged if any members of the Institute will help me by sending in lots of chromite rock. Samples for this purpose should not be less than 100 lbs. in weight, and should be delivered free of expense and accompanied by full information as to locality, etc. Under these circumstances I shall be pleased to work upon them at my first convenience, and to include the result of my experiments in the series.

4. The magnetic separation of blends and galena. One of the serious problems in ore-dressing, in certain districts, is the separation of the above minerals. which often occur together. It is possible to dress the mixed ore so as to produce a fairly clean galena and often also a fairly clean blende, but there is usually a large middle product carrying enough of both to make the stuff worthless as a source of either. Sometimes the precious metal contained is sufficient to justify the saving of this material in spite of the zinc penalty, but often it is not, and the product is thrown away.

We find that in some cases this middle product can be separated into commercially clean blende and equally clean galena. In other cases, it can be divided into two portions, one high in lead and low in blende, and the other just the opposite. The magnetic permeability of these two minerals is unfortunately variable in different cases, and it would be too much to say that all blendes and galenas can be separated or even bettered by magnetic treatment, but, unquestionably, there are many cases where very good results can be obtained at a small cost.

5. The magnetic separator in which these last named experiments are made is a special experimental machine of unusual magnetic power and of great range of adjustment, recently built for us by the Wetherill Company. With it a great many very interesting operations are possible that are far beyond the power of ordinary machines. I will merely name a few.

(a) We have secured some very interesting results in the separation of titaniferous iron sands into portions, one of which is far lower in titanium than the other.

(b) We have separated rare and, in certain cases, valueable minerals contained in a great bulk of other and worthless rock. In this way Monazite has been secured and several other separations have been accomplished. In this work I have again to refer to the late Director of Survey, who in this and the next named tests gave us great assistance, securing samples for our work and aiding us greatly by his advice and still more by his broad and stimulating sympathy.

(c) Finally for this paper, but not I hope for our laboratories we have recently obtained some very striking results from the treatment of hydraulic black sands and others non amalgamable residues. It is not practicable to give details at the moment,

but on some samples, obtained for us by the Geological Survey concentrations to one fiftieth or even less have easily been affected and yet nearly every particle of the gold has been saved. Some figures are, I believe, to be published in this connection in the forthcoming volume of the Geological Survey.

In closing, I thank you for your attention to these very random notes. I should like also to say that the Mining Department at McGill is always more than ready to receive suggestions as to new problems to attack or old ones that may be attacked in a new way. We are also always very grateful for lots of ore on which we can work.

I cannot of course promise to work on everything that is sent in and often even the most interesting things will have to wait for time and the man, but something can be done each year and, as we more fully master the routine portion of our work, the number and value of our investigations should be largely increased.

GRANBY CONSOLIDATED.

The present number of the "Review" had been made up before we received the "Nelson Tribune" containing a three column comment upon our article on the Granby Consolidated Mining Company published in our August issue. We will reply to this article very fully in the next "Review."

COMPANY NOTES.

Bosun Mines.—Writing under date 3rd October, secretary advises:—Telegram from manager reports 80 tons galena shipped during the month of September, smelter returns yielding $3,436. Cable adds, "Mine development shows marked improvement."

McDonald's Bonanza.—A cablegram has been received from Dawson stating that the final clean-up for the season has given 448 ozs. of gold, value, $6,750.

Yukon Goldfie ds.—Cablegram from the company's representative at Dawson City, Yukon :—" Adams Hill United—August output, $7,500."

Klondyke Consols.—The manager's cable:—"Output from 28th August to 10th September—Eldorado, 401 ozs.; Bonanza, 692 ozs.; Hunker, 97 ozs." (Office note—Total, 1,190 ozs., of the value of £3,925. At the average rate of working expenses, 29 per cent., this shows a profit of £2,787 for 12 days' working.)

Le Roi No. 2.—Shipments last month amounted to 2,732 tons, yielding 1,258 ounces gold, 3,300 ounces silver, 68.8 tons copper. Estimated value, $49,000. Net profit after payment of all expenses, $19,000. Average number of men working, 75. Expect to fill force to 130 men by October 15.

Mikado Gold.—October 10. Mikado Mine (Lake of the Woods district), Ontario. During the month of September the yield was 239 ounces from 893 tons, and 127 ounces of bullion from 543 tons of tailings by cyanide.

Canadian Copper.—The mining operations of this company at Copper Cliff, Ont., have been greatly enlarged during the year, and the daily output of six mines is now over 1,200 tons. About 1,500 men are employed in the mines and smelting works, and the pay-roll is almost $30,000 a month.

Nova Scotia Steel and Coal Company.—This company, whose steel works are at New Glasgow, is paying considerable attention to the development of its valuable coal areas at Sydney Mines in Cape Breton. Hiram Donkin, C.E., late resident manager of the Dominion Coal Company, is now in the employ of the company, and is preparing plans and specifications for the construction of a large shipping pier at North Sydney. It will be 67 feet high and 500 feet long. It is to be equipped with apparatus of the latest design for the handling of coal; 600,000 tons, it is predicted, will be the company's output next year.

Baltimore-Nova Scotia Gold Mining.—This company, successors to the Guffey-Jennings Company, at Caribou, N S., is installing a large air compressor and drill. Development work may be continued on a larger scale than ever under the general superintendence of L. W. Getchell. The treasurer of the company is A. S. Dunham, of Boston.

British Columbia Copper.—What is called a phenomenal smelter record for a single blast furnace was established October 1st, when the Greenwood plant put through 484 tons. Of this amount there were 432 tons ore and the balance 12 per cent. coke. The furnace was built with a nominal capacity of 225 tons per diem, but owing to the self-fluxing character of the ore the daily average comes nearer 390 tons.

Vermilion Forks Mining and Development.—This company recently ordered of the Rand Drill Company, of New York, a Davis calyx drill and is about to begin prospecting its coal lands on the Similkameen. The outfit includes a class F drill, for drilling a 3¼-in. hole 300 feet; a 7-H. P. vertical engine, an 8 H. P. horizontal locomotive boiler, pumps, hose and necessary fixtures. The outfit has a total weight of 6,300 lbs., and is mounted on two wagon trucks. An expert driller from Idaho will superintend boring operations. Arthur Hickling, of Princeton, is managing director of the company.

Northwestern Development.—At a meeting of the provisional board of directors of the Northwestern Development Syndicate, Limited, a company recently organized in Nelson, a bond was taken on the Camborne and Oyster free milling gold properties in the Fish River camp, Lardeau. These properties have been under development by the Rosenberger Prospecting Syndicate with, it is said, most gratifying results. While no work has been done at depth, all who have seen the properties are agreed that the surface showings are most remarkable, both as to size of ore bodies and values. The Camborne group comprises nine claims and covers more than a mile of a large auriferous lode, which is exposed in different places on each claim, and at every point of exposure carries gold values, some places being very rich. One ore body 32 feet wide averages $10 gold per ton, and another 10 feet wide averages $28 per ton. The main vein shows in places a width of 100 feet. On the Gold Finch the uppermost claim, are four parallel veins of solid quartz, which have been opened up at many different points and are shown to contain gold values throughout.

NEW COMPANIES.

BRITISH COLUMBIA.

Chieftain Copper Mines of British Columbia, Ltd.—Incorporated 5th Sept., 1901. Authorized capital, $1,000,000, in shares of $100.00 each.

Clover Leaf Mining and Milling Co.—Head office in Cranbrook, B.C. Capital, $75,000. (Extra provincial company.)

Crow's Nest Oil and Coal Company, Ltd.—Incorporated 23rd Sept., 1901. Authorized capital, $200,000, in shares of 10 cents each.

Duncan's Mining and Development Co., Ltd.—Incorporated 9th Sept., 1901. Authorized capital, $40,000, in shares of $1.00 each.

Great Dane Mines, Ltd.—Incorporated 3rd Sept., 1901. Authorized capital, $200,000, in shares of 10 cents each.

Northwestern Development Syndicate, Ltd.—Incorporated 23rd Sept., 1901. Authorized capital, $1,000,000, in shares of $1.00 each.

Ophir Lade Mining Syndicate, Ltd.—Incorporated 31st Aug., 1901. Authorized capital, $120,000, in shares of $200.00 each.

Slocan Republic Mining and Development Co.—Incorporated 5th Sept., 1901. Authorized capital, $1,500,000, in shares of $1.00 each.

ONTARIO.

Black Eagle Gold Mining Co., Ltd.—Incorporated 6th Sept., 1901. Frank Peterson, Rat Portage, Ont., Mine Manager.

The Canadian Oil Refining Company, Ltd.—Capital, $100,000. Head office, Petrolea. H. A. Jamieson, W. D. Todd, Warren, Pa.; E. R. Clarkson, Hamilton; John Kerr, James McCort, and Ed. E. Crant, Petrolea. To manufacture, buy and sell petroleum-oil and other products of petroleum-oil lands.

The Consolidated Mines Company, of Lake Superior, Ltd.—Capital, $1,000,000. Head office: Port Arthur. M. A. Myers, C. W. Stone, of Warren, Penn.; F. N. Gibbs, A. M. Wiley, and Herbert Shear, of Port Arthur.

Rob Roy Mines, Ltd.—Incorporated 9th Oct., 1901. Authorized capital, $120,000, in shares of 10 cents each. Head office: London, Ont.

Standard White Lime Co., Ltd.—Incorporated 2nd Oct., 1901. Authorized capital, $300,000, in shares of $100.00 each. Head Office: Toronto.

Standard Mining Co. of Algoma, Ltd.—Incorporated 2nd Oct., 1901. Authorized capital, $40,000, in shares of $100.00 each. Head office: Sault Ste. Marie, Ont.

Tilsonburg Oil and Gas Developing Co., Ltd.—Incorporated 9th Oct., 1901. Authorized capital, $99,000, in shares of $1.00 each. Head office: St. Thomas, Ont.

QUEBEC.

The Natashquan Iron Co.—Capital, $100,000. Head office: Montreal. Robert C. Smith, K.C.; Jeffrey H. Burland, W. McLea Walbank, Frederick H. Markey, James C. McArthur, Charles A. Barnard of Montreal; John G. Turriff, Ottawa; Robert Stephen Clease, of Shrewsbury, England, and Walter H. E. Jackson, of London, England. For the purpose of acquiring, developing and exploring certain iron or mining properties in the vicinity of the river Natashquan, in the Province of Quebec, and the acquisition of patents for magnetic iron ore separators to be used in connection therewith.

Quebec Asbestos Co., Ltd.—Capital, $100,000. Head office: Sherbrooke. H. W. Mulvena, J. H. Walsh, A. H. Anderson and John W. McGeary.

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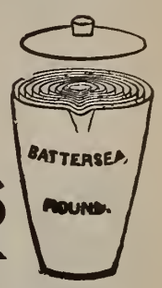

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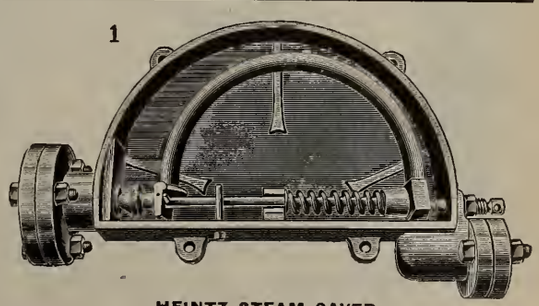

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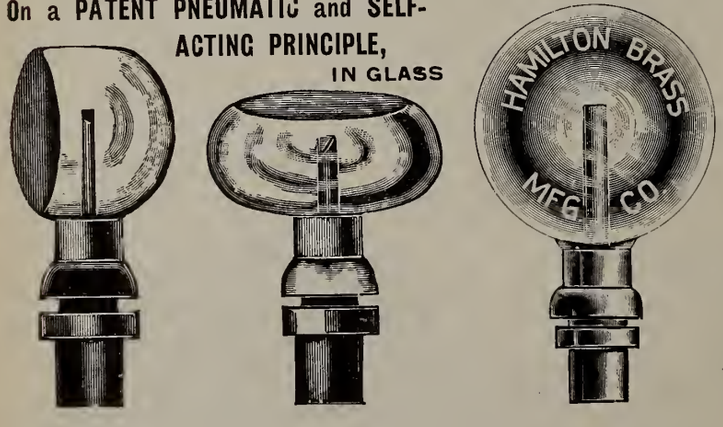

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The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

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Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

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Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

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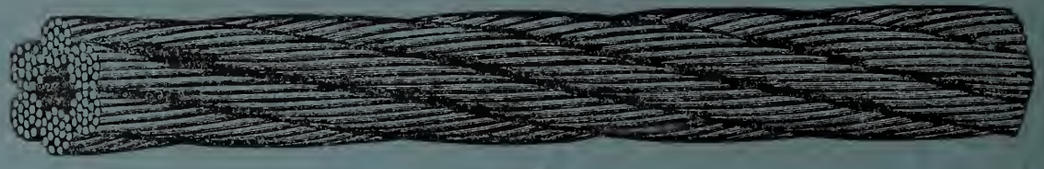

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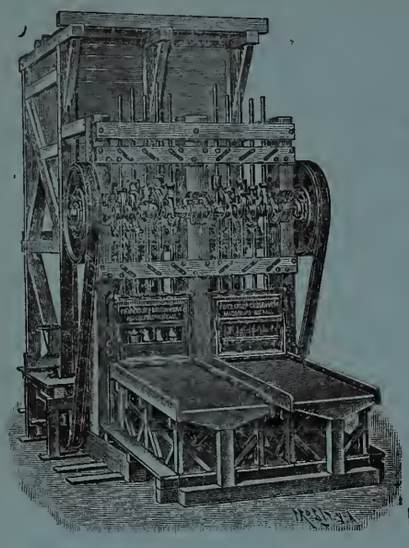

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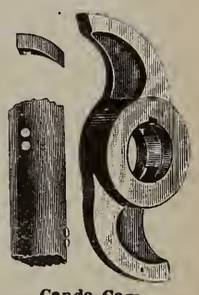

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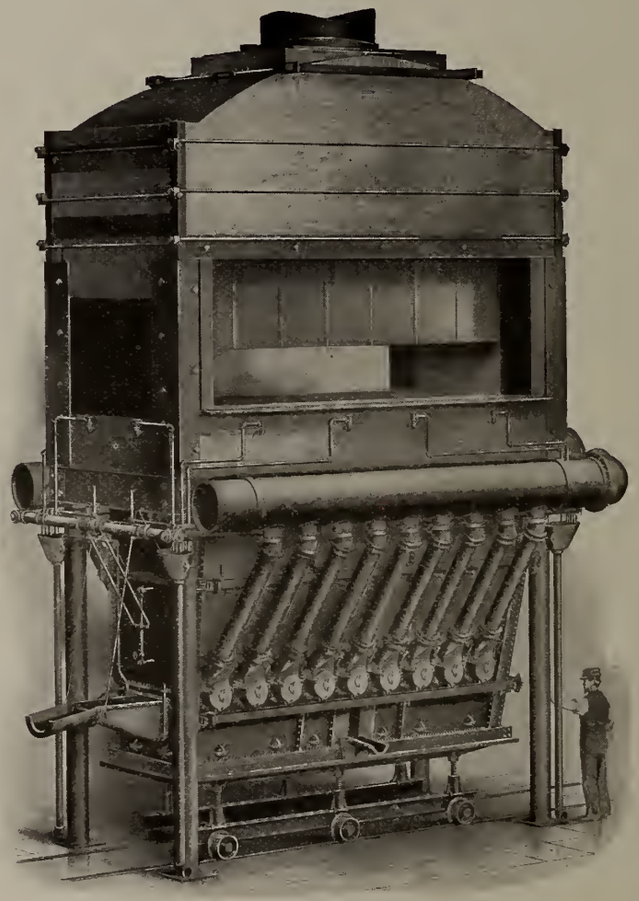

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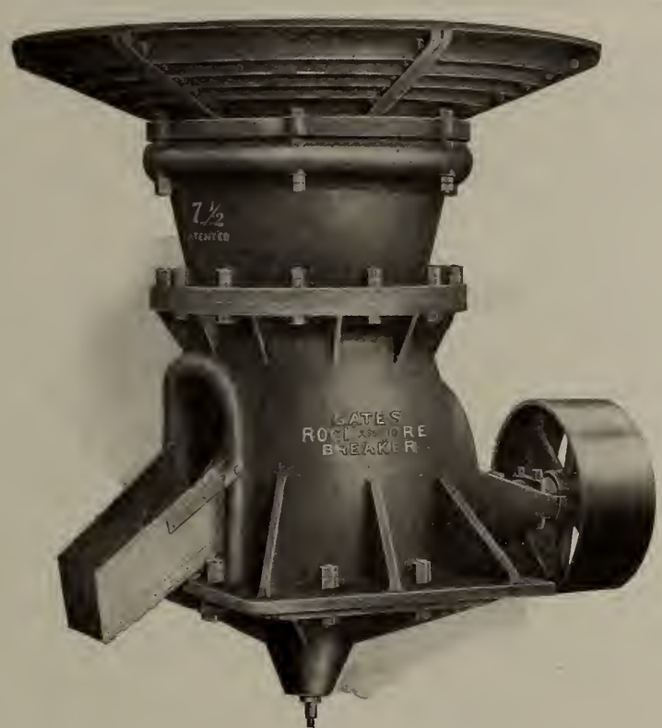

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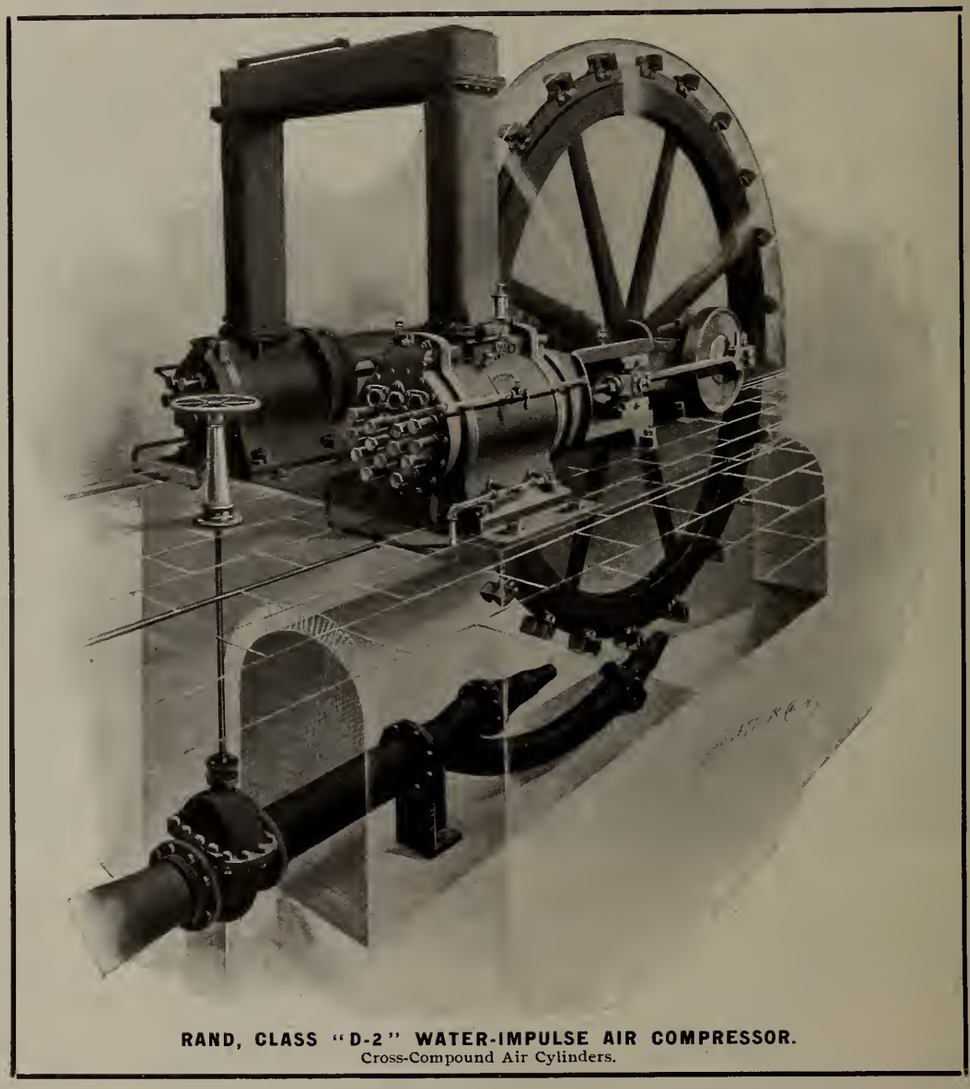

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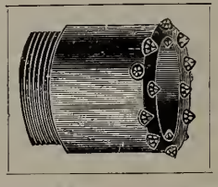

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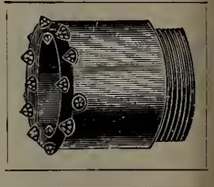

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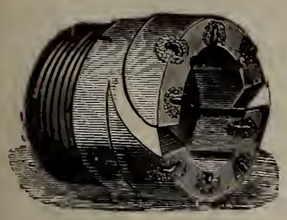

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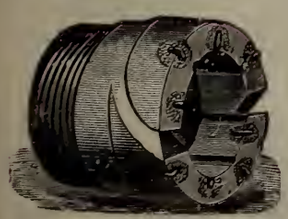

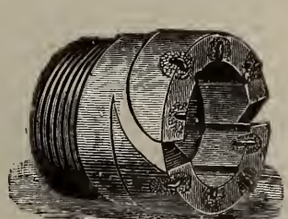

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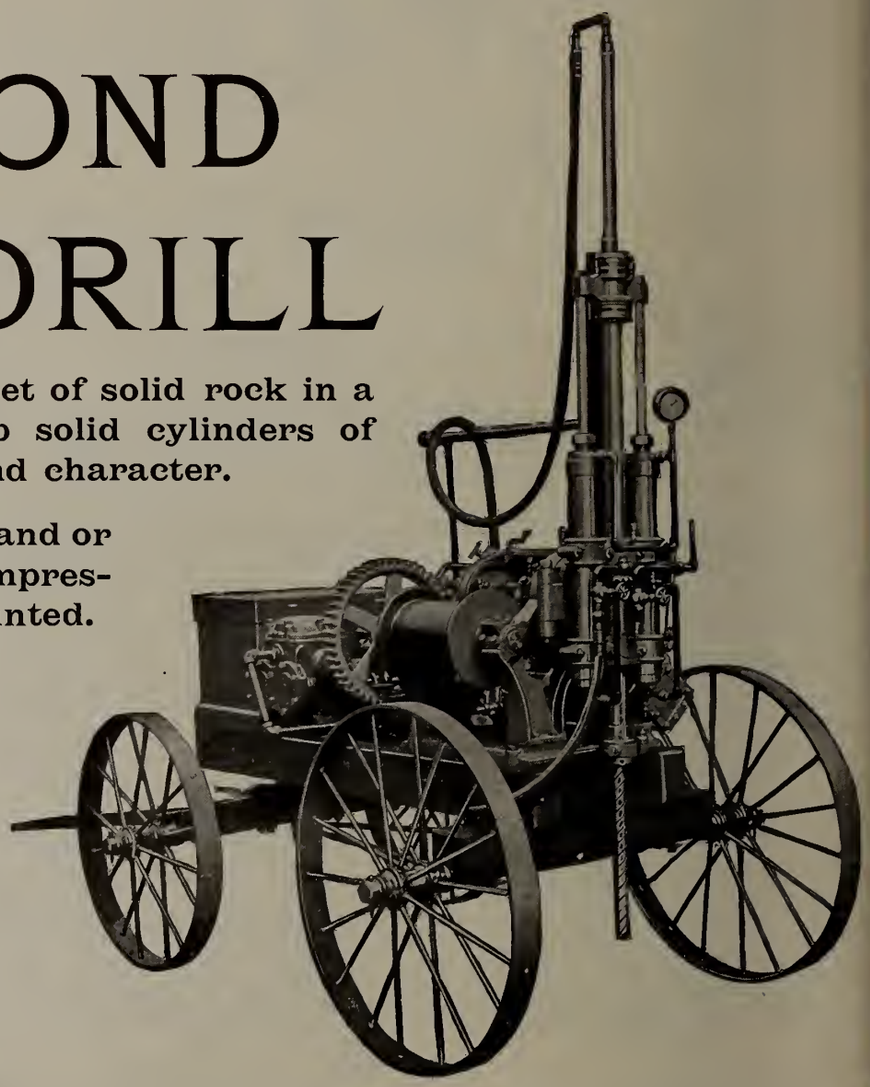

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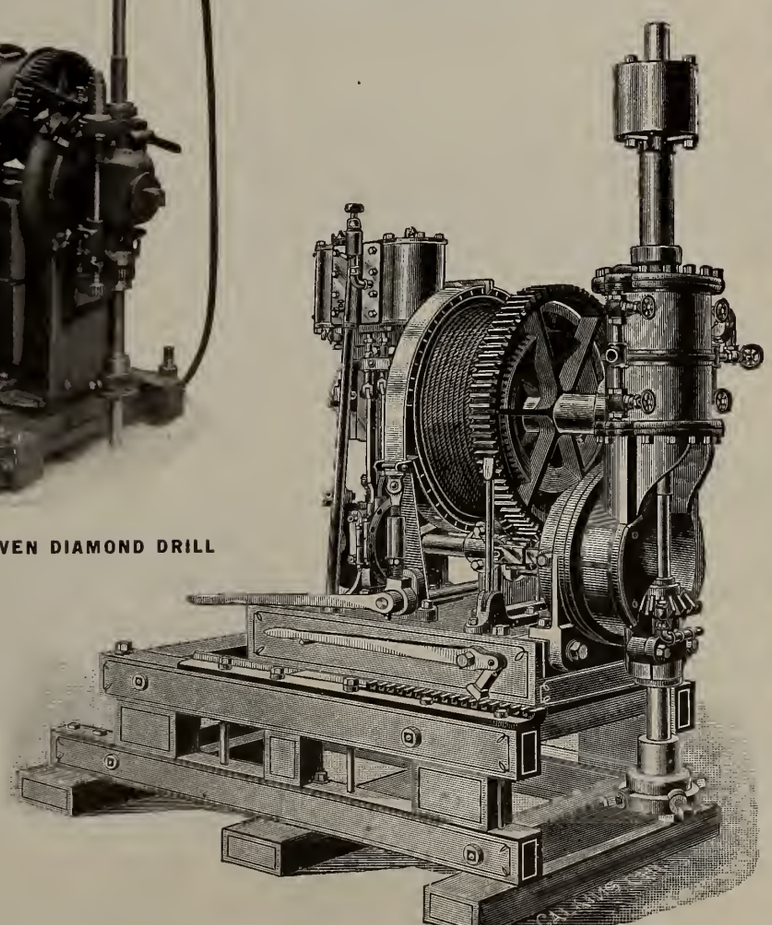

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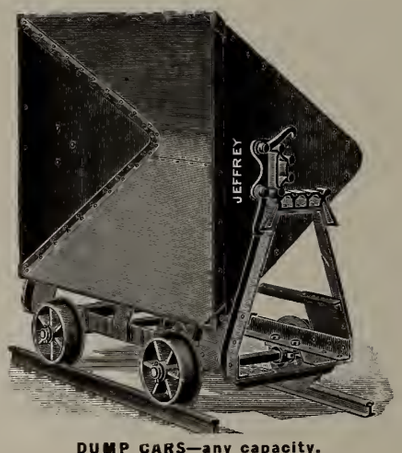

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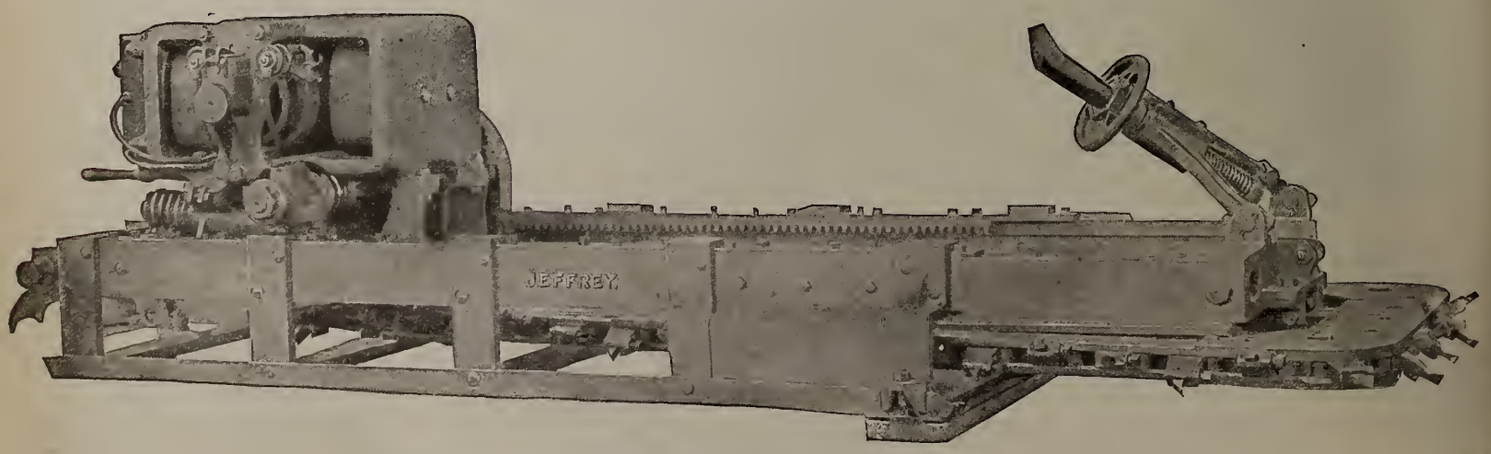

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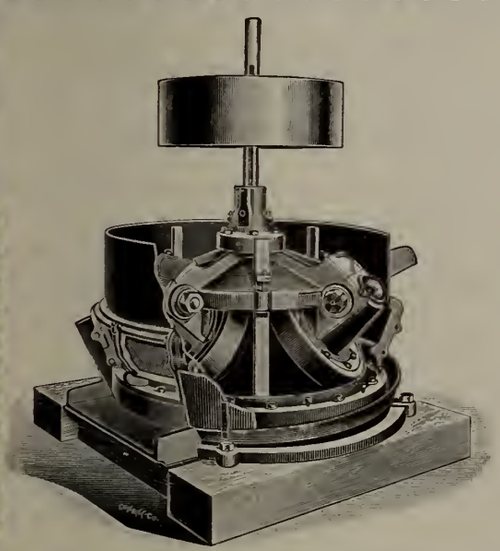

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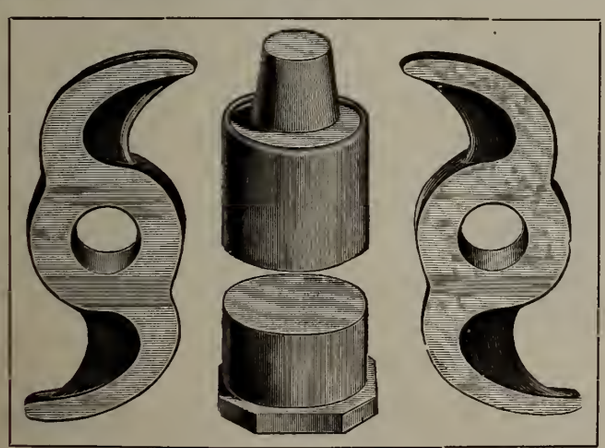

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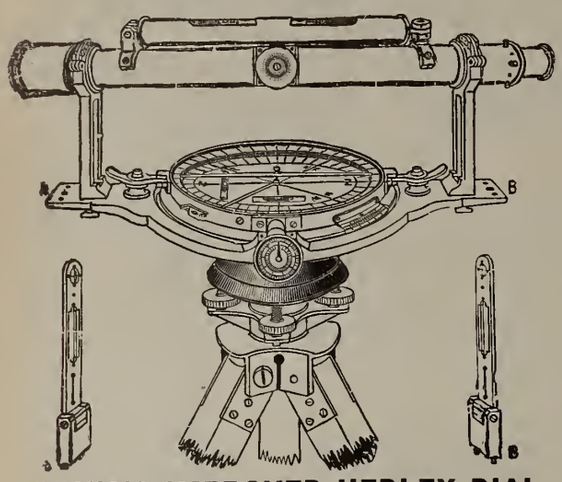

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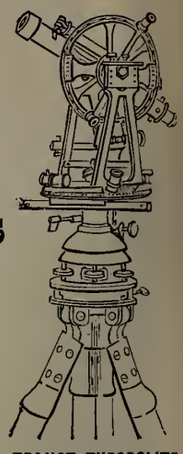

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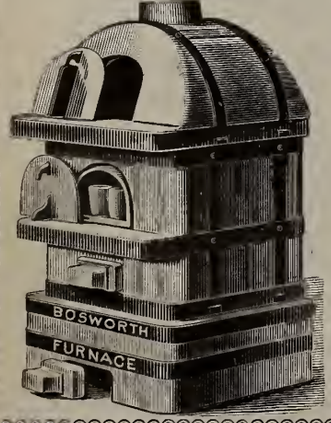

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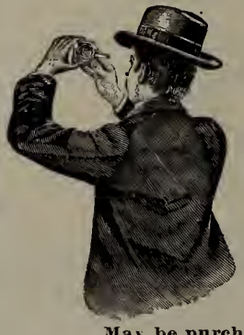

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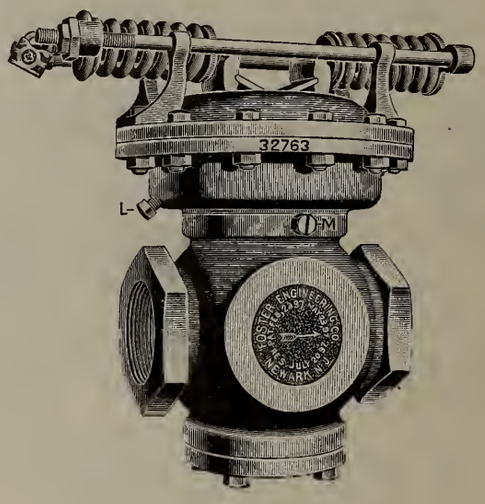

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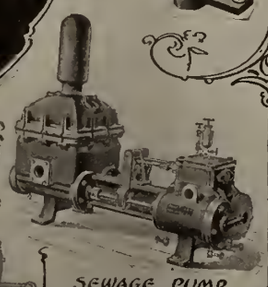
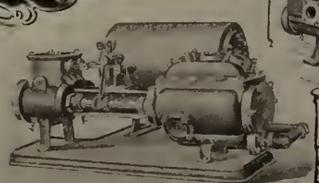
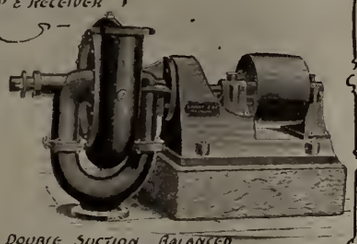
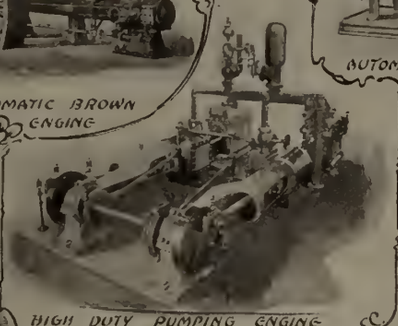
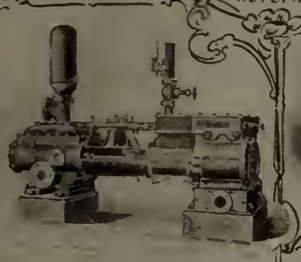

SEWAGE PUMP


AUTOMATIC FEED PUMP & RECEIVER

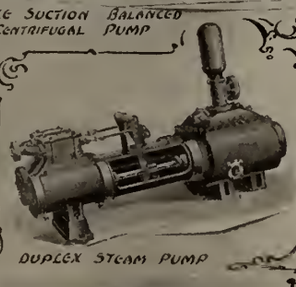
AUTOMATIC BROWN ENGINE

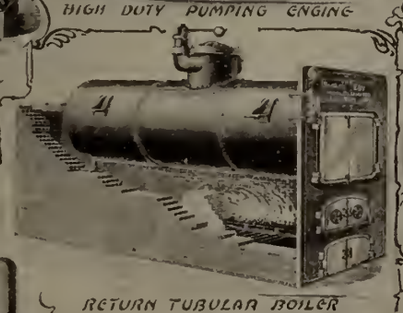

DOUBLE SUCTION BALANCED DISC CENTRIFUGAL PUMP


HIGH DUTY PUMPING ENGINE

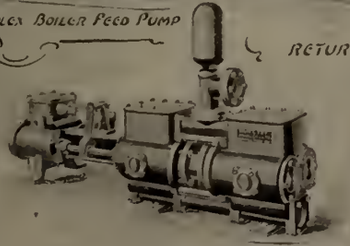

TANDEM COMPOUND PUMPING ENGINE

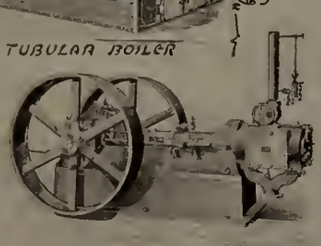
STANDARD VERTICAL ENGINE


DUPLEX STEAM PUMP


RETURN TUBULAR BOILER

DUPLEX BOILER FEED PUMP


CENTRE OUTSIDE PACKED DUPLEX PUMP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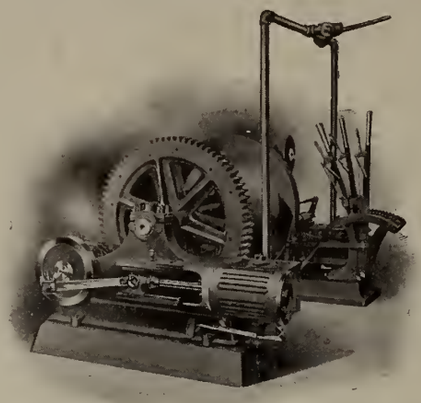

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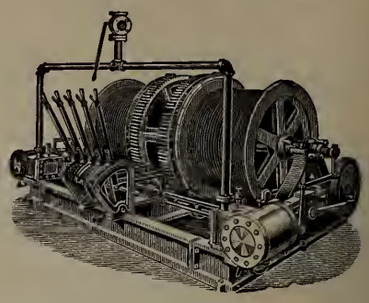

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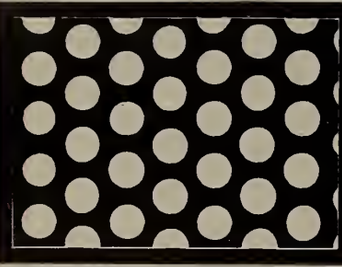

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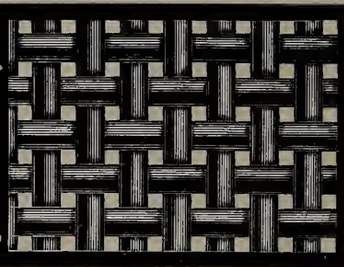

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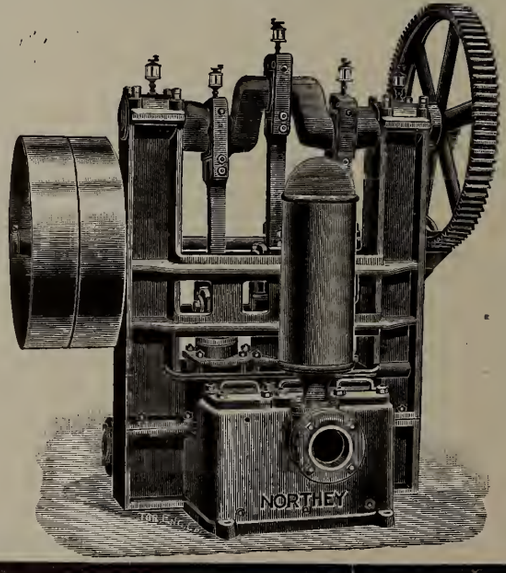

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Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 11. NOVEMBER, 1901. VOL. XX., No. 11.

Granby Consolidated.

In the REVIEW for the month of August we printed a column on the "Granby Consolidated Mining and Smelting Company," which was reproduced in October with approbation by the British Columbia *Mining Record*, and which, after an unaccountable lapse of time, appears to have provoked adverse criticism by that same journal in its November issue, and also in the columns of the Nelson *Tribune*. In our last issue we promised a reply, which we present herewith to our readers.

The article in our August issue was based upon statements communicated to us by one of our correspondents, a well-known mining engineer, at that time (and since) residing in British Columbia. Our correspondent had many means of ascertaining the facts both by inspection and by inquiry, and we published his views as being, in the main, a fair presentation of the complaints which have been repeatedly made to us by shareholders of the Granby Company, whose requests for facts have been refused by the officials of the company. Briefly, our August article commented upon a reported suggestion for the increase of the capital of the company from $15,000,000 to $20,000,000, and upon the dangers of over capitalization, and stated broadly that there were "certain circumstances connected with the Granby Company which were not calculated to inspire confidence, and which, in fairness to their own shareholders, should be explained." We then went on to say that no authoritative statement as to the average value of the ore treated in the furnaces had been given, although the smelter had been in operation for a year or more. We stated that applications for this information had been refused, that it was believed by those in the best position to judge that the average gross value of the ore treated did not exceed $5.00, and we pointed out that it was culpable on the part of the directors of the Granby Company to withhold information without which it was impossible for the shareholders to appraise the value of the stock which they held.

Since the publication of the article referred to, and the attempt at reply made by a Mr. Jacobs of Greenwood in the columns of the Nelson *Tribune*, our correspondent has sent in *his* reply to the *Tribune* which will be found in another place. But the REVIEW has obtained additional information from other sources than this correspondent, and, after due consideration, it sees no reason to abate any of the statements made in the August issue, unless, perhaps, the one referring to the reported assay value of the ore treated. On close inquiry we have ascertained that the gross assay value of the ore has increased since the beginning of the year, and that for the last six months of the present year it *may* have reached the figure of $7.00 per ton. Our correspondent claims that the *average realized value* of the ore is not over $5.00 per ton, all values included. Since the first of April we are credibly informed that the values have appreciated, so that the average gross assay value of the ore for the last six months *may* have been $7.00 per ton; at the same time, on the same authority, we understand that costs have been slightly increased.

The question of whether the average assay value of the ore be $5.00 or $7.00 per ton is entirely beside the mark, for what the REVIEW has desired to bring out, and unquestionably has brought out, is the undisputed fact that this concern with its gigantic capital is keeping its shareholders entirely in the dark as to the results which have been obtained from the working of the mine. The only shareholders who have positive information on this point are the president, general manager, and the secretary, and they have repeatedly declined, evaded, or been silent when requested by shareholders to give the information desired. The connection of one of these gentlemen with the erstwhile boom of some notorious British Columbia incorporations, such as the "Big Three" and the "California," and which were so buttered with misinformation as to cause heavy financial losses in Eastern Canada, is one of the causes of the public demand for fuller information and for square dealing; it also may reasonably cause the shareholders to regard the Granby Company with suspicion when they are refused facts which are legitimately the property of every shareholder in the enterprise.

As to whether or not the Granby Company contemplated an increase in its capital is immaterial; as to the present capitalization of $15,000,000 being enormously in excess of the value of the property, there is no doubt in the mind of any unbiassed person, least of all in the minds of the engineers and officials in British Columbia, who are in the best position to judge. As to the attempts that were made to sell the property last spring in New York, Philadelphia, Chicago and other centres of capital, the REVIEW has never pretended that the *Directors, as a body*, were trying to sell, but some officials were certainly negotiating to that end. We must correct an error which our correspondent made in his August article, as to the price which was asked from the Amalgamated people; it was printed "$2,000,000," it should have been "$12,000,000"; an inquiry of Mr. Leonard Lewissohn will corroborate this statement. There are no other portions of the *Tribune's* article which require extended notice. The quoted statement of President Miner that shareholders have been given "all the information they were entitled to," may be literally true, according to the by-laws of the company, but it is not true according to company equity, or the common law principles of joint stock companies; that the company is not offering any stock to the public is unquestionably true, and for the best of reasons, that the public does not want the stock.

The REVIEW returns to the principles which governed it in publish-

ing any comments upon this company, viz. :—that the past record of some of the officers of the company in connection with other companies cannot but justify the suspicion with which some shareholders regard the secrecy maintained about the working of the property. Secondly, that the published statements of the mine superintendent of the individual companies, now aggregated into this incorporation, have shown such a significant variation and diminution in the average values annually reported in his official communications to the shareholders, that the assumption of $5.00 a ton by our own correspondent is a logical deduction. Thirdly, that a property upon which one million and a half of dollars have been spent, and concerning which no information is available *even to the people who contributed that money*, does not justify a capital of ten times the amount. Until the company authorizes and publishes to its shareholders a statement respecting the value of its ore, and the returns recovered, it will not profit it to get all the backing Western boom sheets can give it. As a matter of fact, the REVIEW desires publicity and honesty. We do not mind epithets in the least. We have seen too many booms and collapses in Canada during the last twenty years to be at all disturbed by such names as "*knocker*," whatever that may mean in Western parlance. The Granby Consolidated Mining, Smelting and Power Company has its chance to set itself right in the eyes of its shareholders and of the public before it comes forward with the flotation of the auxiliary company now under consideration ; if it fails to do this, the public and the press will be perfectly justified in turning down its unsupported pretensions.

OUR CORRESPONDENT'S REPLY.

In the August REVIEW we undertook to comment upon the action of the directors of the Granby Consolidated Mining Company upon two points, the proposal to increase their capitalization from $15,000,000 to $20,000,000, and, as we venture to think, their indefensible conduct in withholding from their own shareholders definite information as to the value of their ore. Other matters were introduced in order to show that the company is already heavily over capitalized, but these were the two main points at issue. The fact that the company could sit down under such damaging and authoritative statements as we were able to make, will carry to all impartial critics the conviction that we spoke not one whit too strongly or two soon. After the lapse of nearly two months, if we are to believe the Greenwood correspondent of the Nelson *Tribune*, Mr. S. C. Miner, the president of the company, has (for something like the fiftieth time) allowed himself to be interviewed on the subject of the Granby Company in general and our article in particular, and so in this roundabout way we are supposed to understand what Mr. Miner says, or rather what he does not say, and what apparently he is unable to say in reply to our criticism.

Practically only one of our contentions is denied, viz., as to the proposed increase in capitalization. On this point Mr. Miner is reported to have said, "We never even thought of raising the capital of the company above its present amount of $15,000,000." On this point we can only say that the fact was stated broadcast in the Canadian press both east and west at the time our correspondence was indited and in fact gave rise to it, and although we quite admit the impossibility of the president of a mining company denying every paragraph that may appear in the papers with respect to his affairs, we can hardly defend his conduct in allowing one of such importance as this to pass without contradiction. However, assuming his statement to be correct, we must accept his tardy denial, and admit that on this point the public press was misinformed and we were misled. The *Tribune* correspondent takes our charges seriatim. We need not occupy space in attempting to combat the statement that the proposition to increase the capitalization had aroused considerable interest in British Columbia, but the next statement, viz., that the present capitalization of $15,000,000 is enormously in excess of the value of the property, is practically conceded by the correspondent who admits that the cash expenditure on the consolidated properties to date is about $1.500,000. He says further that the shareholders of the four companies that combined were satisfied with the scheme of consolidation. It would be strange if they were not, since the stock proposed ultimately to give them something like fifteen times the amount of cash expended. Our point is, that the Granby stock is a commodity which is being dealt in by the public, and whether stock was offered to them in the first instance or not is altogether beside the question, since it is a well-known fact that no sooner was the consolidation effected than the stock was placed upon the market, and has been quoted ever since, although at a continually diminishing figure. Whilst on the subject of cash expenditure, it may be pointed out that our statement was that, at the time of writing, not more than $1,000,000 had actually been expended. The Nelson *Tribune* now admits that $200,000 have been expended this summer. He also rakes in a reference to the value of the town site and other extraneoes matters, so that in any case the correctness of our statement is practically admitted. The *Tribune* next states that Mr. Miner assured him that the directors had not tried to sell the property. As this is not a matter of very great importance we will content ourselves with saying that our information was received direct from the parties to whom the property was offered, and although negotiations were, as we stated, of a preliminary character, they left no doubt upon the minds of the prospective purchasers that the sum we mentioned, viz., $12,000,000, would have been eagerly accepted, and in any case our statement is absolutely correct that the purchaser declined to give this price.

We come now to what is really the whole crux of the question, and one which it seems to us did not require nearly three columns of the Nelson *Tribune* to answer, viz., *the average value per ton of the ore treated.* We stated that it was within our knowledge ; we repeat it, and are prepared, if necessary, to give the names, not to the public press, but to any director of the company, that shareholders have applied directly, both to the management and to the president for an authoritative statement as to the value of the ore, and that in every instance this information has been refused upon the ground that it was not policy to give it. This question is entirely evaded, both by Mr. Miner in the interview referred to and by the *Tribune* correspondent. The former takes refuge in the plea that "No shareholder has been refused information that he was reasonably entitled to." We leave it to the public to judge whether a man who has invested his money in a business is or is not *entitled* to know the value of the property dealt with by the firm in which he is a partner. If not, it is well that it should be known by prospective investors in Granby stock that the directors hold somewhat peculiar ideas as to the rights of shareholders. Passing on to the question of profit or no profit, this point is also evaded by the statement that "The president had on several occasion stated to the shareholders that the ore was yielding a profit, but just what that profit was the directors are not yet prepared to make public." Our point is, that this information is due, first of all, to any shareholder of the company, and, secondly, to the public at large when the stock of the company is on the market as the Granby stock is.

To our statement that "The gross value of the ore treated does not exceed $5.00, and it is doubtful if operations are not carried on at a positive loss," the only answer attempted is the remark of the President that "the new expenditure will more than double our present output and profits." We have not stated as a positive fact that this concern was being carried on at a loss, but have stated, and venture to repeat, that the evidences all point in that direction ; and again we ask, taking the words out of the President's mouth, why is a shareholder not entitled to know that actual amount of profit is being realized by his concern? Summing up his statements, the *Tribune* correspondent makes three propositions as authorized by Mr. Miner: "(*a*) Shareholders have been given all the information they are entitled to ; (*b*) The directors have not even thought of increasing the stock ; (*c*) They are not offering any stock to the public." We have canvassed all these points, and stand just where we did in every respect ; (*b*) having been effectually met by the President's mouthpiece. [Writing under date of Nov. 18th, our correspondent adds : "There is a unanimity of opinion among western mining men that the position of the Granby Company is indefensible. Further you will be interested to know *that the average realized yield of the ore treated for the past three months is not more than $4.00. What do you say to this?*]

NELSON, B.C., 10th November, 1901.

The oil paintings of the late Dr. George M. Dawson, late director of the Geological Survey of Canada and his predecessor, Dr. A. R. C. Selwyn, which are to be presented to the Museum of the Survey by the Canadian Mining Institute, are now on exhibition in Montreal. In these portraits, Mr. F. Brownell, R.C.A., has done excellent work and they were greatly admired at the recent Council Meeting. The The formal presentation of these memorial portraits to the Survey will not likely be made before the Annual Meetings.

Nova Scotia Steel Bonds.

The event of the month has been the issue, through the well known Toronto stock brokers, Messrs. Osler & Hammond, of $2,500,000 six per cent., first mortgage, thirty year, gold bonds on behalf of the recently re-organized Nova Scotia Steel and Coal Company.

The history and progress of this excellently managed corporation are so well known to readers of the REVIEW that it is not necessary now to do more than briefly recapitulate some of the features of this issue for the benefit of those who may contemplate investing in these bonds:

a. The value of the property upon which these bonds are secured, as per Accountant's Report, and before any of the proposed improvements are effected, is $4,250,000 to $4,500,000.

b. The expenditure from the proceeds of this issue will add, in actual value, to the above, about $1,000,000, while the earning capacity of the property will be very largely increased.

c. The average annual profits of the Company, including bounties, for three years past, have been $512,215, while the amount required for the sinking fund, and to pay interest on the *whole* issue of bonds' is only $200,000 per year.

d. When the improvements and developments provided for by this bond issue are completed, it is estimated that the annual average profits will amount to $742,500, leaving a very large surplus over the $200,000 required for the payment of interest and redemption of bonds.

e. Ample provision is made for an increase in the amount to be paid into the sinking fund, if the quantities of iron ore and coal sold in any one year shall exceed the quantities estimated in the prospectus.

f. The Company, as has been pointed out, is not a new and untried concern. The companies comprised in the Nova Scotia Steel and Coal Company, Limited, have done a succsssful business for many years. The earning capacity of the existing plant has been fully established, and the history and growth of the companies for the past nineteen years have given a sure basis upon which to estimate future earnings.

From our personal knowledge of the high character and shrewd business ability of the directors and the unquestionably valuable assets which comprise their large property in Nova Scotia and Newfoundland, we can, unhesitatingly, recommend these bonds to our readers as a sound industrial investment.

The Dominion Government and the Crow's Nest Coal Lands.

In our Western correspondence some time ago there appeared a paragraph which implied that the Dominion Government had been somewhat tardy in protecting the public interest by exercising its first right of selection of the coal lands in Crow's Nest Pass. We are very glad to learn from an interview which we had the other day with the Hon. Mr. Sifton, that the Hon. the Minister of the Interior has been very much alive on this question and that every precaution has been exercised on behalf of the Government in the matter. Perhaps we cannot do better than state what has been done in his own words:—"Early in the spring of 1900, Mr. James McEvoy was detailed to make a thorough examination of the coal-bearing lands, which, I may say, had previously been examined with considerable care by the officers of the Geological Survey. Mr. McEvoy and his party spent the summer making an examination; they had the assistance of a staff of topographical surveyors, and a complete map of the whole district was made showing the coal measures, and this map was fyled with the Department together with a report from Mr. McEvoy giving all available information in regard to the location of the coal deposits. Mr. McEvoy was taken from our service by the Crow's Nest Coal Company, who offered him a salary with which the Government could not compete, the difficulty being, first of all, that these salaries require to be voted by Parliament, and, secondly, that it is impossible for us arbitrarily to raise the salary of any particular officer to keep him in the service, as such an action would result in causing a disparity between the officer so treated and the other technical officers of the Survey, and it would lead, as you can readily see, to complete disorganization of the staff. Upon Mr. McEvoy leaving the service, Mr. Leech was detailed with a party to spend the second or last summer in the work which Mr. McEvoy had been engaged upon during the preceding year. This work has been going on during the past summer. In addition to this examination the tract has been under examination by Mr. Wm. Pearce, D.L.S., who has had a large amount of experience in that section of country; and lastly, a gentleman whom I believe to be one of the best practical coal mining engineers in the United States, Mr. Taylor, the chief engineer of the Pittsburg Coal Company, has made an examination and report.

On the whole, I do not think that any more thorough or complete steps could be taken for the protection of the Government than have been taken in this case. No selection has yet been made. The Government, as you are aware, under the contract, has the first right of selection, and we are now in a position to exercise that right with the information which we have derived by the steps which have been taken as above indicated."

We are very pleased to give prominence to this statement by the Minister of the Interior.

Hall Mining and Smelting Co., Ltd.

The second ordinary general meeting (annual) of the Hall Mining and Smelting Company, Limited, was held in London on the 30th ultimo, Lord Ernest Hamilton, chairman, presiding. The Chairman dealt at length with the balance-sheet presented, and called attention to the fact that the accounts contained in that sheet were made up to the end of the fiscal year. June 30th, 1901. He also presented figures which clearly show the improved prospects of the company since that date, or for the period between the 30th of June and the 30th of October.

The figures of the balance-sheet pertain only to the smelting department of the company, which, up to the end of the fiscal year, had failed to show the profit expected by reason of the fall in the prices of both lead and silver during the fiscal year The London quotations for lead show a fall of £5 6s. 5d. per ton in eight months, or from £17 11s. 11d. a ton, when smelting began in October, 1900, to £12 5s. 6d. a ton in the month of May this year; and the failure to make a profit in the smelting department is very reasonably ascribed to this fall in lead and the coincident depreciation in the price of silver. The estimated loss for the year due to this cause alone is put at £10,000. Another important factor in the unprofitable operation of the smelter was the difficulty of obtaining dry ores, due to the closing down of a great many of the lead mines which also had furnished a large proportion of the supply of dry ores used by the furnace.

In reference to the mining department, Lord Hamilton opens with words of praise for our good friend Captain J. R. Gifford—"Turning from the smelting to the mining department, here, at any rate, I do not think there is the slightest need to introduce the word 'failure' in any sense. I think you will agree with me that the work which has been done at the mine since Captain Cifford took it in hand is really quite remarkable." When Captain Gifford took charge of the mine there was practically not a single ton of ore in sight; at the date of the meeting there were 12,000 tons in sight in the stopes, in addition to the 14,543 tons which had been sent down to the smelter since January of this

year. The Chairman stated that the net profit in the mining department since the 1st of July this year approximated £18,500, and goes on to say "this is really a very excellent record, and too much credit cannot possibly be given to Captain Gifford for his masterly handling of the mine."

As to the prospects for the future, the Chairman is optimistic as to the mine, and believes that the arrangements which have been made, "both as regards the supply of dry ores and as regards the disposal of the lead bullion," will show a marked improvement over the conditions which prevailed during the last fiscal year.

We understand that arrangements have been entered into for the supply of electric power to the smelter to supersede steam power heretofore in use, and it is quite on the cards that the mining department will also equip itself with electrically driven machinery so soon as the manager is convinced of the ability of any of the different machines offered to do the work that is required of them.

The REVIEW extends its congratulations to Captain Gifford, and trusts that the future of this pioneer amongst West Kootenay corporations will be the success it now richly deserves.

Gratifying Progress in Ontario.

The output of the metalliferous mines and works of the Province of Ontario for the nine months ending 30th September, 1901, according to returns made to the Bureau of Mines, amounted in value to $2,822,003, details being as follows:—

	Quantity.	Value.
Iron Ore, tons	216,614	$ 224.546
Pig Iron, "	87,888	1,296,344
Nickel, lbs	6,513,191	737,214
Copper, "	5,950,428	286 376
Arsenic "	975,054	30,432
Gold, ounces	11,008	186,294
Silver, "	98,200	58,797
Zinc Ores, tons	400	2,000
		$2,822,003

A comparison of these figures with those for the year 1900 shows that during the first nine months of the present year the aggregate value of the above products exceeded that for the whole of last year by $280,782, or proportional increase of about 48 per cent.

The largest increase is in the iron industry. In 1900 the output of iron ore was 90,302 tons, valued at $111,805, while during the first three-quarters of 1901 the production was 216,614 tons, worth $224,546. The advance is due principally to the development of the Helen iron mine in the Michipicoton Mining Division, which is now being worked on a scale comparable to that of some of the larger mines in Michigan or Minnesota.

In pig iron, the increase is marked. In 1900 the output was 62,386 tons, worth $936,066, while in the nine months of 1901 it rose to 87,888 tons, valued at $1,296,344. In December of last year the Midland furnace of the Canada Iron Furnace Company went into blast, and has been steadily producing ever since, thus adding materially to the iron making capacity of the province The Midland furnace, as well as that of the Hamilton Steel and Iron Company, turns out coke iron, while the Deseronto Iron Company is running on charcoal iron alone.

A feature of the iron situation is that most of the pig now being made in Ontario is from ore mined in the province. The smelter at Midland uses Helen hematite almost exclusively, and the same ore is also largely employed at Hamilton. There were 156,731 tons of iron ore smelted during the nine months, of which 93,165 tons, or 59 per cent., were from Ontario mines, the remainder being American ore.

The nickel industry, under the stimulus of active demand and higher prices, continues to expand steadily. The actual producers of matte are the Canadian Copper Company and the Mond Nickel Company. The former have now twelve furnaces in commission, turning out ordinary grade matte at the rate of about 100 tons per day, which is re-treated at the Ontario Smelting Works, and brought to a metallic content of about 80 per cent. before shipment.

The Creighton mine, which is being opened up by this company, is a very promising property, and bids fair to prove the largest deposit yet uncovered in the district. The body of nickel ore comes right to the surface, and 500 tons a day are being taken from an open cut and shipped to the roast yards at Copper Cliff.

The Mond Company's mines and works are at Victoria Mines, where a substantial and modern smelter plant has gone into operation during the present year, having a capacity of about 200 tons of ore daily. The Bessemer process is employed, the molten matte going direct to the convertors, thus doing away with intermediate handling. The result is a matte containing practically nothing but nickel and copper sulphides, the iron being burned out down to about one per cent., and the metallic contents of nickel and copper being about 80 per cent.

The Clergue syndicate is opening up the Gertrude and Elsie mines not far from the Creighton, and is preparing roast beds and breaking ground for a smelter at the Gertrude.

Of nickel-copper ore, 222,133 tons were raised during the nine months, as against 216,695 in 1900; the quantity smelted being 158,194 tons, producing 20,723 tons of matte. The value (in the matte) of the nickel contents was $737,214, and of the copper $286,376, as against $756,726 and $319,681 for the whole of 1900.

The purely copper ores of the north shore of Lake Huron are receiving a good deal of attention, and 10,100 tons of these were raised during the nine months. The Rock Lake Mining Company's mine and mill are now almost in shape for making concentrates, and the new railway from Bruce Mines will be completed and running into the mine some time in December. The Stobie, Massey Station, Superior and other properties in the development stage are showing up well. The Bruce mines are still closed down, but are likely to be reopened in a short time.

Arsenic is distinctively an Ontario product as well as nickel, neither being produced elsewhere in America. The Canadian Goldfields at Deloro is now treating the auriferous mispickel found there with great success. The output for the nine months was 975,054 lbs., valued at $30,432, as against 606,000 lbs., worth $22,725 in 1900.

The yield of gold shows a decrease as compared with last year, due mainly to the lessened production of the mines of Western Ontario. There were 11,008 ounces reported, having a value of $186,294. New properties, both east and west, are being fitted up for turning out bullion, and, with prudence and skill, there seems no reason why some of the low grade ores of the Seine River and Lake of the Woods should not show good profits if worked on a large scale.

Of silver, 98,200 ounces were produced worth $58,797, mainly from the mines of the Port Arthur region, though the old Victoria silver-lead mine near Echo Lake is again in operation and turning out concentrates.

The active mining regions of Ontario are growing in importance and output, and the present year shows high water mark for iron, nickel and copper, the three chief metals found in the province, not only in the matter of ore production, but also as regards the manipulation of the raw materials and their conversion into finished, or nearly finished, articles.

Canadian Trade in Mining Machinery.

If evidence were required of the great and rapidly growing importance of the mining and smelting industries of the Dominion to the trade and commerce of the country, it will be found in the immense volume of trade being done by our mining companies with the manufacturers and dealers in mining machinery and mining supplies. For the past couple of years this trade in Canada has aggregated several millions of dollars, and such etablishments as the Cooper Manufacturing Company, the Canadian Rand Drill Company, the Jenckes Machine Company, Wm. Hamilton Manufacturing Company, and other Canadian engineering establishments, have been worked to their fullest capacity, while a very large trade has been done with other countries, most notably the United States. Some idea of this expansion may be gathered from the following figures, compiled by the REVIEW, from the Trade and Navigation Returns periodically published by the Department of Customs. The following table shows the value of the mining and smelting machinery imported free of duty during the fiscal years ended 30th June 1900 and 1899:—

	1900.	1899.
Nova Scotia	$320,038	$ 24,243
British Columbia	182,087	88,911
Ontario	145,040	142,216
Quebec	30,661	26.621
New Brunswick	10,246	212
Manitoba	1,600	1,080
N. W. Territory	674	10,926
Yukon	33,841	5,591
	$724,187	$299,800

The following table shows the monthly returns of the value of the mining and smelting machinery, free and dutiable, imported into Canada from 30th June, 1900, to 30th September last:—

Month.	Free.	Dutiable.	Total.
1900			
July	$59,222	$7,570	$66,792
August	129,398	2,544	131,942
September	151,211	2,786	153,997
October	170,954	175	171,129
November	110,393	6,801	117,194
December	103,794	28,724	132,518
1901			
January	111,134	4,196	115,330
February	162,030	9,689	171,719
March	62,185	806	62,991
April	52 921	517	53,438
May	259.309	6,180	265,489
June	162,674	12,269	174,943
July	58,919	4,267	63,186
August	70,979	16,428	87,407
September	84,479	599	85,078
Total	$1,749,602	$103,551	$1,853,153

The following table shows the sources from which our imports of mining machinery, free and dutiable, were derived:—

Month.	From United States.		Great Britain.		Other Countries.	Total.
	Free.	Dutiable.	Free.	Dutiable.		
1900						
July	$54,766	$7,570	$2,320		$2,136	$66,792
August	125,751	2,544	3,647			131,942
September	147,351	2,786	3,860			153,997
October	162,637	175	8,278		39	171,129
November	103,993	6,801	6,400			117,194
December	98,164	4,734	5,630	$23,990		132,518
1901						
January	111,129	4,196	5			115,330
February	162.030	9,689				171,719
March	58,980	806			3,205	62,991
April	51,971	517	950			53,438
May	257 523	6,180	1,786			265,489
June	162.369	10,602	305	1,667		174,943
July	58,486	4,267	433			63,186
August	70,764	16,428	215			87,407
September	82,945	518	1,534		81	85,078
Total	$1,708,859	$77,813	$35,363	$25,657	$5,461	$1,853,153

EN PASSANT.

The gold medal awarded by Mr. Charles Fergie, M.E., President of the Canadian Mining Institute, for the best Student's Paper contributed to the Transactions of the Institute during the year has been awarded by the Council to Mr. E. V. Corliss (McGill) for his paper on "The Coal Mines of Fernie, B.C."

A Dominion Department of Mines will, it is understood, be established before very long at Ottawa, its administration, like that of the Survey, being directed by the Department of the Interior. Such an institution is certainly required to bring the mineral industries of of the Dominion more prominently before the public and we trust the Government will see to it that no niggardly policy is pursued with respect to its maintenance and equipment. Capable officers are required and these cannot be obtained on the beggarly scale of remuneration meted out to the staff of that other excellent institution, our Geological Survey.

Arrangements for the ensuing Annual Meetings of the Canadian Mining Institute are well forwarded and a large and interesting syllabus of papers is already assured. In addition to these a new feature will be the "Topics of Discussion," which are being arranged for with the object of eliciting a livelier interest in the proceedings among our mine managers and mining engineers. Such practical topics as "Ventilation," "Air Compressing," "Haulage," "Pumping," "Power Drills," are sure to interest our mine managers, particularly, as we understand these will be introduced by some of the best posted authorities upon them. The meetings, as usual, will be held in Montreal during the first week in March.

The Mining Society of McGill, an active organization of the Mining and Science students at McGill University, has, or at all events, will very shortly be affiliated with the Student's Section of the Institute.

In a recent number the *Nelson Miner* works off a rather good and typical story concerning our old friend Hector McRae. It appears that several years ago, he and his pal, Sandy Dick, who, we are glad to see, has since reformed and gone into the more stable production of coal, had their eyes on the Ophir group on Porcupine Creek, claims which to-day are reported to be held by their owners at a very high figure. The claims at that time were in an inaccessible country and investigation not proving satisfactory they were turned down. Hector's report was to the following effect:—

The company which he proposed organizing was called the Australian-Canadian Tellurium Mining, Smelting and Development Company with a capital of $75. Alexander Dick, W. H. Corbould and Hector McRae were the three stockholders, and Harry Hughes was selected as prospector in chief. The report tells how this fearless explorer started out and examined the property of the Lade Brothers. "A firm but friendly offer of $50 was made for the group and refused as the the owners wanted $119,950 more than this sum. Mr. Hughes refused to purchase the property for the reason that the claims were located 19,000 feet above the townsite of Ferguson, while the latter is situated, roughly speaking, 7,200 feet above sea level. The claims are bounded on the north, east, south and west by glaciers, and are suitable for cold-storage purposes and summer resorts. The vein matter at the bottom of the shaft will not go $12,800 to the ton, and the ore although called a telluride more nearly resembles a free milling pyrrhotite, plumbic gasoline composition such as is found in Nel-

son, Quartz Creek, Rossland and Water Cress mining districts bearing no resemblance to Cripple Creek or Klondike rock. After failing to secure the claims at his own figure Mr Hughes made an ascent of the mountain to the Mother lode of the glacier. Here he located after many hardships and hairbreadth escapes three square, life-sized claims, upon which he had seen cropping through the ice a large, well defined true fissure quartz vein from 15 to 20 feet wide and God only knows how deep. An average sample was taken and submitted to Mr. McKillop and the result was gold, no traces; copper, no trace; silver, no trace; charges, $7.50. Timber for mining purposes would not be available as the timber line is a mile away in a vertical direction. Another drawback to profitable mining is the shortness of the summer season which only lasts from July 1st to July 4th. Of the funds entrusted to Mr. Hughes there remained for a short time $1.65. The sum was almost immediately spent in purchasing stimulants for the resuscitation of Mr. Hughes who was in a deplorably nervous condition from the hardships of his trip. From the foregoing report it is obvious in order to maintain the good name of the company, that an immediate assessment of $2.50 per shares be levied for liquidating the bill for assaying."

Mr. Bernard MacDonald, M.E., who, since the resignation of Mr. Carlyle, has managed the properties of the British America Corporation at Rossland, has resigned, and rumour has it that he will assume the management of the Anglo-Canadian Lead Syndicate's mine at Lake Temiscamingue, Que.

A trial shipment of one ton of black mica has been made from the recently opened up mica deposits worked by Messrs. Dainard & Hoar, on Ice River near Golden, B.C. The shipment was consigned to Robert Ingram of Manchester, England. By the way, during the past season the bulk of our exports of mica has found a profitable market in England.

Gold dredging on the Saskatchewan and other rivers in the North West Territories still continues to attract considerable attention. The Edmonton *Bulletin* writing of the operations during the season just closing, says:—

The past season has not seen any startling strikes made in the industry, but one or two most valuable facts have been demonstrated; one is that by the process improved and adopted by Mr. Hobson, all the gold that is lifted and put through the washing process of the dredges is secured and saved. This has been the great difficulty and drawback to successful gold dredging here, the mineral is so fine and flakey in form that in washing it from the gravel in which it is found, much of the gold was lost, carried away by the water. This difficulty has been successfully overcome, and if nothing else were accomplished this alone would be recompense for the summer's work and expense. Mr. McDonald, the New Zealand mining expert, claims that they are now saving all the fine gold. He says that the gold-bearing sands and gravel of California yield a rich harvest when they run as high as 10c. or 11c. a cubic yard, while the gravel of the Saskatchewan averages 50c. per cubic yard, an exceedingly rich proportion. The process of mining, says Mr. McDonald, has centred down to one and only one successful method, that is the ladder and endless chain of buckets. Dipper dredges have been tried and found too slow; suction dredges have had their pipes cut out and the principle has been abandoned. The ladder and endless chain system has been the only one to prove successful. The Otter, Minto, and Alberta, the three dredges which have worked here this summer, were fitted with this style of machinery, but none of them proved entirely satisfactory. The reason of this partial failure was not in the weakness of the principle but in the weakness of the machinery. The machinery had been designed in England by supposed-to-be competent mining engineers, but was found altogether too weak in parts to do the work which it was called on to do in dredging into solid gravel banks. Thus numerous break-downs occurred during the summer, and it was always some weak link in the machinery which was found to have given way. The Minto was launched on the 4th of May, but it was not until July that the dredge could be got to work. She was run for only short intervals during the summer, the break-downs being of frequent occurrence, and at last was condemned with her machinery and laid up for complete overhauling next season. The Otter made by far the best run of the three, though even she did not run at anything like her theoretical capacity. Probably at no time during the season did she run at more than ten cubic yards per hour, bar measurement. Her results would necessarily have been much larger had she not been forced, through having no coal tender, to work on bars in the vicinity of the town which had been worked over by grizzley miners for the past thirty years. The following table shows the number of hours and yards she has worked this season: May, 49 hours, say 490 yards; June, 247 hours, say 2,470 yards; July, 362 hours, say 3,620 yards; August, 130 hours, say 1,300 yards. In speaking of the work of dredging here Mr. Hobson said: "It is now past all experimenting and is on a practical basis. The only thing now wanting is the dredge to lift the gravel, but caution should be used in the construction, and I should advise that a practical man make a thorough inspection before determining on the plans of new dredges for the Saskatchewan."

The Minto worked about 2,000 cubic yards, her machinery being very unsatisfactory, and though much of the gold was lost, through these defects, she saved at the rate of 28c. per cubic yard. With all the dredges the amount of gold washed was not so great as it might be, but the amount of gold saved for each yard of gravel washed was quite satisfactory. The machinery for moving the gravel might be deficient, but the richness of that moved was all that could be wished for.

OUR ILLUSTRATIONS.

Mining in the Atlin District, B.C.

Through the courtesy of our friend Mr. R. D. Featherstonehaugh, manager of the Atlin Mining Company, we are able to give our readers this month reproductions of several excellent photographs of the mining operations being carried on in the Atlin District of British Columbia. As far as can be said at present the gold bearing area of this district consists of a tract of country immediately east of Atlin Lake and city, some ten miles wide by fifteen to twenty miles back from the lake, the greater part of which all lies in the basin of Pine Creek and Surprise Lake, with their tributaries, Boulder, Birch, Spruce, Otter and Wright Creeks. McKee Creek runs parallel to Pine Creek and is some seven miles south of it. It has a length of about eight miles and contains some good ground. There appears to be a relation between the productive ground and the nature of the rocks in the Placer district which may be useful in defining the gold bearing areas. At the present time, however, it cannot be said that the creeks outside of the boundaries indicated have had a fair trial. In fact there are many possibilities for this district, which suffers under no disadvantage of frozen ground. Provided plenty of water is available the extent of pay gravel may be largely increased by hydraulic mining on a more economical scale than the costly methods employed by the individual miner on his 100-foot claim. The gold is usually coarse often as flat little flakes about the size of flax seed up to nuggets of half an ounce. Nuggets usually well rounded, of several ounces, are not uncommon.

As a rule the gold is not much associated with black sand or other heavy minerals, excepting on Wright Creek. Here the amount of black sand, pyrites, and bits of native copper, is large. The usual method of working is adopted to the short claims. The creeks or portions of them turned through sluice boxes which pass beside the excavations made to bed rock. Into these sluice boxes the pay dirt is shovelled while the boulders and barren stuff are thrown back on the washed out ground as the excavation proceeds. The pay gravel is commonly found at or near bed rock and some times a few inches of the softer bed rock carries gold. The whole process of getting down to this pay ground and disposing of the muck and boulders on a 100-foot claim is expensive, and it can also be seen that a single season spent on this small area often leaves it pretty well worked out. On the larger streams such as Pine and Spruce Creeks, the water is diverted by wing dams, while the bed and banks are shovelled up into the sluices as before. Water wheels work Chinese pumps and so keep the excavations from flooding. The gold is by no means confined to the present stream beds, but these afford the most accessible concentrations wherever bed rock is shallow. Good pay was said to be taken from several of the low, rocky benches adjacent to the streams by reducers and in other places drifting into the banks has exposed pay gravels probably of an earlier period.

Returns of the gold yield from this district published by the Mines Report for British Columbia show that there were produced in 1898 placer gold of a value of $75,000; in 1899 $800,000; and in 1900 $450,000 in addition to 120 ounces valued at $2,497 won from quartz mining.

Mica and Phosphate from the Blackburn Mine.

The two photos which we publish were recently taken by Mr. R. L. Blackburn and give but a small idea of the actual mining which has been done on the old Blackburn mine at Templeton, Ottawa County, Que. The Blackburn mine has been actively operated almost continuously for a period of twenty years, the original owners being McLaurin and Blackburn who mined it for phosphate and made considerable money out of the enterprise. In these early days of phosphate mining mica was of no commercial value and the output was gladly sold for anything it would bring, its use being chiefly confined to roofing purposes. To-day the conditions are entirely reversed and the then much abused black mica is now eagerly sought for and realizes a handsome profit while the phosphate once so profitable realizes a comparatively small return. The big pit of the Blackburn mine is one of the largest open cast workings in the Dominion. It is worthy of remark that the bulk of the output of mica from this mine has lately found a market in England.

Slocan Sovereign Silver-Lead Mine.

We are indebted to Mr. G. F. Ransom, Sandon. B.C., for the two views of the Slocan Sovereign Mine—one of a group of silver-lead claims in the Slocan district of British Columbia owned and operated by the Slocan Sovereign Mines Company, Limited. In a letter describing the work done on the property Mr. Ransom says:—

"Work has been carried on by five tunnels, the longest being 790 feet, giving a depth of 600 feet. Ore is showing all through the lead in bunches. There is sufficient stoping ground for some fifteen months. Running parallel with this dry-ore lead is another some 60 feet apart. This has only lately been discovered. The surface showing has four inches of clean ore running 90 oz. in silver and 75 p.c. lead. The leads run direct through the properties some 6,000 feet and several cars of ore have been taken out this spring netting good returns. The Sovereign mine, situated on Reco Mountain just below the once famous Reco Mine, has two leads running through it, namely, the Reco vein and Goodenough. Some very high grade ore has been taken out of the latter. Most of the work has been done on the Reco vein, No. 4 tunnel being in 1,400 feet. Stoping has only been started, yet, during 1900, 150 tons were extracted. There is sufficient ground ready to keep twenty men busy for two years in No. 3 tunnel. There is two feet of solid ore showing running 108 ozs. silver, and 80 p.c. lead; also in a crosscut run a short time ago, eight inches of steel galena was struck. The mine is located two miles from Sandon. By extending the lowest level into the Reco ground we would get some 2,000 feet depth. Ore house, two blacksmith shops, two bunks and a cook house are in good repair. I trust during the coming year to see lead and silver advance. As it is now there is very little encouragement to ship your ore. We have some 2,000 tons of concentrates on the dump which would run less than 4 to 1. As soon as satisfactory arrangements can be made this will be shipped and will nett a good return. Altogether the future of the S.S.M. Co. Ltd. is a bright one and we trust as soon as everything is in working order to see dividends."

COAL MINING AND TRADE.

At the close of a very busy shipping season, onlookers are already beginning to canvass the work done by the Dominion Coal Company during the present year. A net increase of nearly half a million tons is something substantial, and exceeds the expectations of those who thought they were best able to judge. Evidently the new management has been very energetic, and, in addition to extensive economies, has also paid special attention to the possibilities of a wider market. Shipments to the States, as well as to the home markets, have increased satisfactorily, but the interesting feature is the establishment of an export trade. Reports have already been received from the assistant manager, who is making a European trip, enclosing orders for something in excess of 20,000 tons. These are practically trial orders, and will determine the placing of considerable contracts both in England and Norway. It is satisfactory to find that these orders have been placed with so little trouble; at the same time it is well to bear in mind that the English coal is put upon the market in first-class condition, and any negligence in shipping Nova Scotian coal is sure to result in the closing of the market, in fact one of the greatest difficulties to be encountered in this export trade is the shipping of the coal across the Atlantic without too much breakage. It will certainly have to be double screened, and sent in larger sizes than is customary for the Canadian trade- The prospect of a permanent trade is, we think, good, because there are many signs and conditions showing that the average selling price of coal in the Old Country is going to rule at a higher figure than during late years. The cost of production, which was in the neighborhood of 6s. 3d. for the past twenty years, is certain to be exceeded in the next twenty. Labor unions are stronger than ever, and no doubt there will be a tendency for wages to assume a higher level. At the present moment wages are at least 50 per cent. above standard rates, and, although if there should be the usual depression in trade following a period of inflation, there will undoubtedly be some reduction in wages, it is certain that they will not fall again to the old standard, and it is necessary, in order both to secure and retain what may ultimately prove to be a far larger market than the Canadian or American, to send clean, carefully screened coal, and to be moderate in fixing the price. Obviously there is no room for high prices when transportation across the Atlantic has to be added, but upon the basis which we have frequently discussed in these columns, and which first originated the idea of transatlantic trade,

there should be no difficulty in securing remunerative prices, and so develop the most important industry of the maritime provinces.

At the end of the season it is interesting to notice what has been done in the new mines which have been developed on the Island of Cape Breton. At Port Morien, the Gowrie & Blockhouse Company have continued to develop somewhat slowly, their present capacity not exceeding 300 tons a day. It is only fair, however, to say that they have a difficult seam to work, and that it will take several years to develop to a large tonnage, if they are able to place it on the market.

At the Port Hood Colliery development is proceeding, although hampered by insufficient surface accommodation and the recent damage done to the shipping pier. At date the slope is down 800 feet, and is being carried further. The capacity of the mine is about 200 tons daily.

At Broad Cove, more substantial work has been done. A large bankhead has been erected with picking table and conveyors, modelled after the Drummond Colliery bankhead, although on a larger scale. Engine, fan and pump are being installed, miner's cottages are in course of erection, and every preparation is being made to ship a considerable tonnage next season. The quality of the coal is satisfactory but the pitch has increased somewhat, being now about 16 per cent. There is also more water than was anticipated, but the pumps are well able to deal with it. Next season will see this coal a serious competitor with the older mines.

Mr. T. J. Brown has entered upon his term of office at the Old Sydney Mines by making extensive alterations and improvements. The coal lying to the crop of the old working is being opened up so as to shorten and cheapen the cost of haulage, which for many years has been an exceptionally heavy item in this mine. The manager, however, will not have a fair show until the old mine is abandoned and a new one opened. We understand that this is now under consideration, and that next year will see practical steps taken to establish one of the largest mines on the island at some point north of the present mine and ultimately to develop an important producer of coal. At the moment of writing the prospectus of the Nova Scotia Steel and Coal Company is before the public, and we have no doubt that it will be liberally responded to. There is no company in the Dominion possessing more genuine and valuable property, nor one which is more likely in the future to be remunerative to investors.

Reverting for a moment to the Dominion Coal Company, it is interesting to notice that during last month the output aggregated 260,000 tons. Of this the Caledonia contributed 55,000; Dominion No. 1, 65,000, and Reserve, 72,000 tons. These are large figures. The policy has been concentration, and the end of the present year will afford an admirable test of its effect. It is just announced that the International Mine is being closed down for the winter months. This will be a disappointment to those who thought the mine would be kept running, but we shall not be surprised if it is not the forerunner of the closing of the International, which for the last four years has been both troublesome and expensive in consequence of the large body of water to be dealt with. It looks as if the future of the Dominion Coal Company depends upon the Phalen seam, and that the management is looking to obtain all the tonnage required from this important measure.

Increased interest is aroused in the coal areas of New Brunswick by reason of the activity of an American company under the presidency of Mr. J. P. Geddes of New York. This company has commenced serious operations about 30 miles north of Moncton. A shaft has been sunk and is rapidly approaching a six foot seam which had been located at the outcrop. First-class machinery has been purchased, and every effort will be made to develop an active mineral property. Hitherto such attempts have not been a success in New Brunswick, owing largely to the thinness of the seams and the inferior character of the coal, and it remains to be seen whether the new discovery will be any better. In any case, if the cost of production is not too high, there would be a fair local market, such as is found throughout the Western States, where, in the absence of bituminous coal, there is a profitable demand for lignite.

In the west the coal trade is as active as ever, although there is some falling off in the demand for coke in consequence of the Rossland strike, the laying off of the Northport smelter and the reduced production of lead ores. In consequence of this, the Crow's Nest Coal

St. Lawrence Coal Deliveries.

We are indebted to Messrs. F. A. Routh & Company, Montreal, for the following returns of the Bituminous Coal Deliveries by Water to St. Lawrence Ports during season of navigation just closed :—

	Montreal.		Sorel.		Three Rivers.		Quebec.		Total.	
	1900	1901	1900	1901	1900	1901	1900	1901	1900	1901
The Nova Scotia S & C. Co.....Tons	60,014	2,985	5,154	1,236	4,080	5,095	24,321	32,143	93,569	41,459
Dominion Coal Co..... "	571,223	795,630	9,889	3,448	15,636	15,750	46,659	48,805	643,407	863,633
Intercolonial Coal Co..... "	30,742	33,555	.....	1,850	.....	480	13,270	3,863	44,012	39,748
Gowrie and Blockhouse..... "	.....	.....	.....	.....	.....	.....	.....	1,725	.....	1,725
Port Hood..... "	.....	.....	.....	.....	.....	.....	.....	150	.....	150
Cape Breton Coal Co.. ..... "	.....	.....	.....	.....	.....	1,200	.....	.....	.....	1,200
Scotch, English & American (by Sea) "	19,444	76,928	.....	784	.....	.....	.....	3,510	19,444	81,276
	681,423	909 152	15,043	7,318	19,716	22,525	84,250	90,196	800,432	1,029,191

MINING IN THE ATLIN DISTRICT, B.C.

Hauling Hydraulic Plant for Atlin Mining Co. on Lake Atlin, April, 1901.

Flume of the Atlin Mining Co., McKee Creek.

MINING IN THE ATLIN DISTRICT, B.C.

Monitor at work on the property of the Atlin Mining Co., McKee Creek.

Atlin Mining Co., McKee Creek, B.C.

MINING IN THE ATLIN DISTRICT, B.C.

Constructing Flume on McKee Creek for the Atlin Mining Company, Atlin, B.C.

Showing Dump of the Atlin Mining Co.

MINING IN THE ATLIN DISTRICT, B.C.

Working on the Atlin Mining Company's Flume Line, on McKee Creek, Atlin, B.C.

Atlin Mining Company's Pressure Box on McKee Creek, Atlin, B.C.

MINING IN THE ATLIN DISTRICT, B.C.

Hauling Machinery to "Race Horse" Group, Atlin, B.C.

No. 29 and 30 above, on McKee Creek, Atlin, B.C.

MINING IN THE ATLIN DISTRICT, B.C.

Monitor at work on McKee Creek, Atlin, B.C.

Atlin Mining Company's Flume on McKee Creek, B.C.

SILVER-LEAD MINING IN BRITISH COLUMBIA.

Group, at Slocan Sovereign Mine, Slocan District, B.C.

Argenta Ore House, No. 5 Tunnel, Slocan Sovereign Mine, Slocan, B.C.

Silver-Lead Ore stacked at Kaslo Sampling Works.

Six hundred tons of Phosphate (Apatite) awaiting shipment during the winter season at the Blackburn Mine, Ottawa County, Que.

Underground Works of the celebrated Blackburn Mica and Phosphate Mine, Ottawa County, Que.

Company have "damped down" half their coke ovens, and are only shipping about 200 tons daily. At the mines, development is being pushed by the new manager, Mr. T. R. Stockett. The present output of coal averages 1200 tons daily, a very small figure after four years' development, but one which it is believed will be largely increased during the next few months. The new works of this company on the north side of the Morrissey Creek are not yet producing coal in consequence of delay in the construction of a branch railway. This, however, is expected to be completed some time in January, and shipment will then commence. By that time the capacity of the new mine should be about 500 tons a day. Mining operations on the north side of Michel have been practically discontinued in consequence of the unsatisfactory character of the coal discovered. This section of coal is evidently affected by the limestone upheaval, which is visible within three or four miles of Michel Creek on the north side. This upheaval has affected the coal both as to strength and quality, the percentage of ash running as high as 10 or 12, compared with 5 to 7 per cent. on Coal Creek. In order to utilize the extensive plant which has been erected, the company are endeavoring to locate a mine on the south side of this creek, and have just let a contract for driving a tunnel 500 feet through the strata to catch a seam of coal 14 feet in thickness, which has been uncovered in the mountain. The driving of this tunnel will take about six months, and, if successful, will lead to the opening of a good seam of coal.

At the coast, trade keeps moderately good, the falling off of the San Francisco demand being an important factor. At the annual meeting of the New Vancouver Coal Mining and Land Company, the usual vote of thanks was passed and commendatory remarks were made about the veteran manager, Mr. S. M. Robins, who has been so successful in carrying the operations of this company to the present position. The usual dividend was paid.

During next season material light will be thrown upon the extent and character of the coal discoveries recently made in the interior of the province. On the north fork of the Kettle River several parties have located seams of bituminous coal of coking character. Most of these seams are too thin to be worked profitably, but at the moment every effort is being made to discover thicker seams. In the Similkameen Valley several companies have taken up areas, and are about to commence boring. Excellent seams of lignite have been located in the neighborhood of Princeton and on the Tulameen River. At least one large seam of bituminous coal, approximately 14 feet in thickness, has been found. Less important discoveries of coal have also been made near Fairview upon the east side of the Okanagan Lake. A well-known syndicate has also taken up areas at Nicola. The object of this company is to locate a high-class coking coal in the centre of the province which would dominate the smelter trade of the Boundary country and the coast. The first company to successfully solve this problem will realize large profits. The accumulation of evidence as to the low grade quality of Boundary ores renders it absolutely imperative that the cost of production should be brought to the lowest possible point. Crow's Nest coke at nearly $8 00 delivered is a serious item, and if a similar coke can be produced in any of the districts named, the short haul would enable it to be laid down in the Boundary district at $5.00 a ton, a saving of at least 50 cents in the treatment. Since the latest advices go to show that the average value of Boundary ore is much lower than people have imagined, it will be seen how important it is that this question of cheap treatment should be solved.

The Dry Ores of the Slocan, B.C.

By R. C. Campbell-Johnston, M.I.M.M., Nelson, B.C.

(To be discussed at ensuing Annual Meetings of the Canadian Mining Institute.)

In submitting a paper on this subject to the members of the Canadian Mining Institute, the author is aware of the very large scope of area in which these ores occur in Slocan, and also of the many professed and actual commercial successes in treating this character of ore used locally, in Australia for Broken Hill ores, in the United States, Mexico and South America. The object of the paper is to draw the members' attention to this existing area, to recite the experiences of those engaged in mining these ores, to relate the present attempts to treat the ore and so pay dividends to the shareholders, to suggest other treatments that may be applicable, and to gather the members' experience and ideas on the subject, so that this rich area may become another gem in Canada's diadem, and so make us all even more proud of the country we live in.

As far as the author can ascertain there is no fixed division between the terms "dry" and "wet" ores, to limit the hard line where one ends and the other commences. For the purpose of describing the ores of this district a return of 10 per cent. and less of metallic lead to the ton is spoken of as a dry ore, and over 10 per cent. as a wet ore.

All these ores are rich in silver values, some also containing gold, and some not; in fact the ores are phenomenally rich.

The area included, especially in this district under discussion, is bounded on the north by the divide between the Lardeau and Slocan, stretching from Kootenay Lake to Arrowhead Lake; bounded on the east by Kootenay Lake, on the south by Kootenay River, and on the west by the Arrowhead Lakes and the Columbia River. This division contains an area fifty (50) miles wide from east to west, and forty (40) miles long from north to south. There are other parts in the Lardeau, East Kootenay and elsewhere containing dry ores, but the scope of this paper must be limited, and so mention must be left to another time.

This Slocan area is composed of granite rocks, certainly a broad description, but sufficient till those with more leisure than the mine managers can make slices of the country rocks and classify them from a microscopic examination. The granite surrounds patches of slate as exhibited from Silverton to Whitewater, and south from Carpenter Creek to the village of Cody. There is a strip of other varieties of igneous rocks carrying copper, gold and silver along the north bank of the Kootenay River; and a strip of metamorphic rocks at Ainsworth. Outside of these isolated exceptions we may say broadly the country rock is granite. In the slate as typified by the Rambler-Cariboo mine, they have followed their vein through the slate into the granite with even enhanced values occurring. The author would especially draw the members' attention to the ores on Springer, Lemon, Ten Mile, the head of Four Mile, including Fennell, Cody, Kokanee and other Creeks. Among the many mines containing these ores are the Arlington, Hewett, Enterprise, Bondholder, Fisher Maiden, Republic, V. & M., Erin, Evening Star, No. 8, Exchange and others.

Let us first look at the characteristics of the veins carrying these ores. So far as known there are at least four series of veins. First from Twelve Mile Creek going south across Springer to Lemon Creek are six (6) parallel veins within a zone three thousand (3,000) feet wide, known by development to traverse the country for five miles. Their strike is N 20° W, S 20° E, with an easterly dip of steep pitch, and they are strong veins varying from six to thirty (6 to 30) feet wide of vein matter between walls. They generally have a pay streak of extra rich ore on both hanging and foot wall, from a few inches to two feet wide, each one; then often one or more pay streaks lie in the vein matter between the outer streaks with some values distributed throughout, so that by stoping out the whole vein from wall to wall, twelve dollars

($12.00) and more per ton in gold and silver alone can be averaged from the mass. These mines of this series have a future of large tonnage, and that must be treated economically to pay dividends. Typical mines of this class are the Republic, Erin, Peerless, Combination and other groups.

Then intersecting these first veins are others with strike E 5° N and W 5° S (all points of the compass are described magnetically), dipping south with wide vein-matter carrying mostly silver values, most often in streaks. Typical of this series are the Rainbow, Wavertree, Evening Star, No. 9, Wide West, and others. The Howard Fraction is reported to have the same strike with a northerly dip.

Another type the author has not examined is represented to the east of Republic Mountain by the Myrtle Group, where a vein occurs traversing also the Rainbow, I. X. L. and Morning Star on Springer Creek. The strike is reported N 10° E and S 10° W with dip west, and the ore is high grade in silver values. Farther east we come to the type of small high-grade veins represented by the Enterprise, Bondholder, Mabou, Missing Link, Premier and Evening Star No. 8. These veins traverse the country for six miles with average strike N 28° E and S 28° W, and dip east, carrying high silver values, but no gold to speak of.

This Enterprise series intersects the Republic series apparently on the Premier and Evening Star No. 8 groups, near Dayton Creek.

Intersecting the Enterprise series again is another series, viz.: the Arlington one. Here we have large veins striking N 10° E and S 10° W with dip east contrary to the Myrtle type.

This series is represented by the Arlington, Speculator, Mabou, Neepawa, Enterprise, Bondholder and others with parallel veins. These have streaks of pay ore like the Republic series, carry gold and values, represent large tonnage, and require economical treatment.

There is much more yet to be learned about the characteristics of the dry ore series in question. Though some development has been accomplished, a large amount more is still desirable, executed by skilled engineers who realise what they are accomplishing, and who form their judgment from facts before them, sifting out fact from theory. This curt account of the series, however, is given in the hope of obtaining others' ideas.

Next has to be considered the mode of occurrence and constituents of the pay ore. Where gold occurs, as a rule it is not free, but alloyed or mechanically mixed with iron pyrites, a long disputed difference. The silver is sometimes alloyed with galena, zinc-blende, copper sulphide, or antimony sulphide not in masses but dispersed through quartz gangue. At other times the silver is native, or as argentite (sulphide of silver), and in a few cases apparently chloride (horn silver). In all cases there are base metallic values with the precious metals in the gangue of the veins.

Now comes the crux of the whole matter. Nature has put the minerals in the veins with lavish hand to be extracted by the ingenuity of man.

The ores having been wrought, how are they to be treated on a commercial scale to secure an extraction of at least ninety per cent. of the values, and also bring the profits to the shareholders?

Now profits are given away to such vampires as railways and custom smelters, who suck the life-blood out of the mining industry, just when expenditure of working capital promises success, by exorbitant overcharges, though bonused by the country. If possible, any transportation expenses from the mine to the railway, and so to the smelters, must be saved on an average grade of ore; therefore, what is wanted is a process to treat the ore at the mine.

At present general teaming charges are $3.00 per ton. Freight and treatment on railway and at smelter are charged from $8.00 to $12.00 on dry ores (help the wet ore charges), the two vampires do not make separate charges for each division of labor, but combine against the hapless mines. Put mining charges on to the above cost, then masses of $12.00 ore are useless to the mine owners. Under present circumstances hand sorting is resorted to, or in other words, the eyes of the mine are picked out, leaving a lower second grade class of ore than if the mass was shipped. The owners fondly hope that in some dim future the vampires will lower their charges to allow this second grade ore to be shipped, but will they?

Another kind of sorting is introdued, viz.: Wet concentration by roll crushing and jigs with settling tanks for the silver slimes.

This reckless method, as proved in all mining districts where this class of ore occurs, may save seventy (70) per cent. of the values, hopelessly losing for all time the balance.

This is only picking out the eyes of the mine in another way, for the silver as argentite, antimonial, etc., will not settle effectually enough to permit its recovery. These facts all show that the mine to pay as its values warrant must have its ore treated in bulk by some smelting or chemical process.

Transportation charges of coke and coal and the necessary fluxes up to the mine to counteract the zinc contents, or want of sufficient lead, in most cases prohibit a smelting process.

We can only then begin where Broken Hill has left off in their costly experiments lasting over many years, having in our favour over them cheaper power from our creeks to generate electricity, abundant timber for all purposes, cheaper fuel in coal and coke, and possible fluxes in the district.

Their hope is in the Phoenix process of bessemerizing with chlorine gas, and using a cycling chemical reaction. Rumours are rife of other processes there. Magnetic separation of blende from galena will not help us where the silver is unalloyed with lead and zinc. Would this system of treatment help us, viz.: Dry crushing, dry concentration with sizers and Clarkson-Stanfield's centrifugal machines, or with pneumatic blowers, then treating the product, briquetted or sintered if necessary, by the Phoenix process?

We have to put our heads together to think out, and spend money in trying to solve successful extraction, that will add millions to the world's wealth, and many dividends to the lucky shareholders interested in these Slocan mines. Let us remember that the big tonnage of average grade ore, when effectually treated, make larger and more permanent mines than shipments only of rich picked material.

British and Canadian Lead.—The accounts of the British and Canadian Lead Company for the period ending 30th of June last have been issued. The property which this company is operating is in the Lake Tamiskamingue district, in the Province of Quebec, and, as we have already pointed out in these columns, although the ore is of lower grade than that found in the majority of the Slocan mines, they have been able to ship to English and German smelters at a profit. The average value of the ore bodies per short ton is stated to be about 47 per cent. lead and 15 ozs. of silver. The ore is concentrated at the mine at a ratio of about 5 to 1, and the returns from the smelter after payment of transportation and treatment will average about £10 per ton of concentrates. The company made shipments to a New Jersey smelter, but, owing to the excessive charges and the large deductions, they found they could make better profits by shipping their ore to Europe. The report states that, at the present low price of lead, 25 tons of concentrates per week will pay all expenses including current development. As is very common with this class of ore, the concentration problem has proved somewhat difficult, as there is a tendency to lose a portion of the silver values in the slimes, but, in spite of the fall in the price of lead and the long transportation of the ores to the smelter, the mine is, we understand, working on a profitable basis.

Mikado.—It is announced that during October the yield was 254 ozs. of gold from 1,071 tons of ore, and 91 ozs. of bullion from 535 tons of tailings by cyanide.

CANADIAN MINING INSTITUTE.

Affiliation of McGill Mining Students—Many New Members Elected—Arrangements for the Annual Meeting.

On Thursday evening, 14th instant, an important meeting of the Council of the Institute was held in the Library, Windsor Hotel, Montreal, Mr. Charles Fergie, M.E., President, in the chair.

NEW MEMBERS.

The SECRETARY presented the following applications for membership, the nominations being approved :—

C. Shields, General Manager, Dominion Coal Company, Glace Bay, Cape Breton.
B. Bennett, Mine Manager, Messrs. King Bros., Thetford Mines, Que.
Dr. Eugene Haanel, Superintendent of Mines, Department of the Interior, Ottawa Ont.
Chas. J. Coll, General Manager, Acadia Coal Company, Stellarton, N.S.
Thomas Cantley, Nova Scotia Steel & Coal Company, New Glasgow, N.S.
D. Forbes Angus, Intercolonial Coal Company, Montreal, Que.
P. L. Naismith, Manager, Alberta Railway & Coal Co., Lethbridge, N.W.T.
Dr. Alfred Stansfield, Professor of Metallurgy, McGill University, Montreal.
A. S. Burrows, Manager, Rock Lake Mining Co., Bruce Mines, Ont.
T. H. Crabtree, Mine Manager, Union Asbestos Mines, Black Lake, Que.
C. R. Corning, Mining Engineer, 36 Wall Street, New York, N.Y.
W. R. Wilson, Mining Engineer, 22 Burford Road, Nottingham, England.
B. Crowell, Mining Eugineer, 731 Williamson Building, Cleveland, Ohio.
A. H Bromley, A.R.S.M., Mining Engineer, 18 Eldon Street, London, E.C., England.
W. F. Best, Analytical Chemist, 28 Broad Street, Victoria, B.C.
H E. Coll, Superintendent, Vale Colliery, Stellarton, N.S.
Robert A. Johnson, Chemist, Geological Survey, Ottawa, Ont.
Captain W. M. MacKay, Dawson, Yukon, Canada.
Walter R. Kerr, Thetford Mines, Que.
C. S. Wilcox, General Manager, Hamilton Steel & Iron Co., Hamilton, Ont.
Louis J. Abrahams, F.G S., Mining Engineer, Bruce Mines, Ont.

AFFILIATION OF McGILL MINING STUDENTS.

Dr. FRANK D. ADAMS submitted a letter from the Secretary of the McGill Mining Society stating that the members of that body at a recent meeting had unanimously agreed to affiliate with the Student's Branch of the Institute.

On motion of the Secretary it was resolved to recommend that the affiliation be confirmed at the ensuing Annual Meetings.

DEATH OF MR. JAMES F. LEWIS.

The SECRETARY in fitting terms referred to the great loss the Institute had sustained since they last met in the death of their old friend and fellow-councillor, Mr. James F. Lewis, of Sherbrooke, Que., and submitted the following resolution :—

"*Resolved*, That the Members of the Council of the Institute at this, their first meeting together since the sad event, take this opportunity of expressing their grief at the lamented death of their colleague, Mr. James F. Lewis, of Sherbrooke, Que., who died in Boston on 23rd July last, and that they hereby enter in the Minutes a note recording their appreciation of his high personal character and the services he so cheerfully rendered towards promoting the welfare and success of the Institute."

Mr. HARDMAN suggested that an obituary note concerning their late friend and co-worker might fittingly be incorporated in the next volume of the Journal of the Institute, and agreed to prepare same for publication.

ELECTION OF COUNCILLOR FOR QUEBEC SECTION.

The SECRETARY moved that the vacancy created by the death of Mr. Lewis be filled until the next Annual Meeting by the appointment of Mr. George E. Drummond, of the Canada Iron Furnace Company, Montreal. The election was agreed to.

ELECTION OF A PATRON.

The SECRETARY having referred to the great interest which the Hon. the Minister of the Interior was taking in the mineral industries of the country and the likelihood that there would at no distant date be organized under the administration of his Department an efficiently equipped Department of Mines for the Dominion, moved that the Hon. Clifford Sifton M P , Minister of the Interior, be elected a Patron of the Institute. The motion was unanimously adopted.

STUDENT'S MEDAL AWARDED.

After discussion the Council unanimously agreed to award the gold medal, presented by the President, for the best paper contributed by a mining student to the Transactions of the Institute during the year, to Mr. E. V. Corliss (McGill) for his paper on "The Coal Mines of Fernie, B.C."

NOMINATING COMMITTEE.

In terms of the Constitution and By-Laws the following were appointed a committee to nominate a slate to fill the vacancies occurring in the Council at the Annual General Meetings :—Messrs. Hardman and Dr. Adams from the Council, and Messrs. DeCourtenay, Dr. Porter and Milton L. Hersey, from the members

NOTICE OF MOTION TO RESCIND A BY-LAW OF THE INSTITUTE.

Mr. HARDMAN gave notice that at the next meeting of the Council he would move that the By-Law providing for the recording of votes by proxy be abolished.

THE LIBRARY.

The SECRETARY submitted certain resolutions affecting the location and administration of the Library, but after some discussion decided to postpone a vote upon them until a later meeting of the Council.

ANNUAL MEETINGS.

The PRESIDENT suggested that as the weather was somewhat unsettled in March, it would be better if the date of the Annual Meetings were changed to the first Wednesday in February, and he would give notice of motion to amend the Constitution at the next Annual Meetings so that the change might be carried into effect thereafter.

Dr. ADAMS, on behalf of the Science Faculty at McGill, offered to the Institute the use of one of the lecture rooms at the University for the meetings. The President thanked Dr. Adams, on behalf of the Council, for his offer, but thought that as most of the members reside at the Windsor during the meetings, it would be more convenient, at least for this year, to hold the meetings there as formerly.

The SECRETARY announced that promises of over thirty papers had been intimated, and that in addition, and with the object of creating greater interest in the proceedings among the mine managers, a number of practical topics were being arranged for. These included "Air Compressing," "Pumping," "Power Drills," "Hoisting," "Ventilation," and "Haulage." The subjects would be introduced by some of the best authorities on these questions and it was hoped that the innovation would not only create a livelier interest in the proceedings, but be conducive to a good discussion of the subjects from those who ordinarily were not heard from at the meetings.

A sub-committee comprising the President, Dr. Adams, Mr. Hardman and the Secretary, was appointed to select and arrange for the presentation of the various papers.

Mr. HARDMAN agreed to present a "Topic for Discussion" on the subject of "Government Aid to Mining."

This being all the business, the meeting adjourned.

Queen Bess Proprietory Company.

The fourth ordinary general meeting of the Queen Bess Proprietory Co., Limited, was held this month at Winchester House, Old Broad Street, London, Mr. Edward Hart presiding.

The chairman said : I will first deal with the figures which, as you will see, only come up to the 31st March last. The revenue account shows that during the year the ore sales have realised £17,682, out of which sum part was stock in hand. The realisation of ore actually mined during the year amounted to £15,537 ; and as this represents only just over 1,000 tons of ore, you will gather from that how very rich the ore we mine is. The result has been a gross profit of £5,891, which is carried to the general account and against which are charged the expenditure in British Columbia, £3,162 ; the depreciations written off, £498 ; and London offices expenses, £1,088 ; so that it leaves a net profit of £1 471, as against that of the previous year of £726, showing a great improvement as far as that goes. After adding the balance brought forward from the previous year, it shows £1,900 to dispose of. The directors propose to write off from the development account £1,500, carrying over £400 odd the balance.

The balance sheet shows that the creditors have greatly increased on the one side, going up from £2,000, roughly, to £4,300 ; and on the other side the cash is considerably reduced. Mining expenditure shows a very much increased figure. These are the principal features, I think, of the balance sheet. If there are any other items the shareholders would like to have particulars of, I should be very pleased to answer any question. The fact is that during the past year we have been developing entirely, and we have been using all the money obtained from the ore for that purpose, and more than we have obtained. As to that, I shall have a little more to say presently. With regard to the output for the period under review, you will see that the average value per ton realised has been £16 9s. 6d. for galena, per ton, as against £20 5s. the previous year, and £8 5s. 3d. for carbonates, as against £8. Of course the drop in the galena is due almost entirely to the fall in the price of lead, which has been a very serious thing to us During the period I think the price has averaged from £18, the highest, to £13, and it has since dropped to a little over £11, so that you will see that as our ore contained some 63 per cent, of lead, it means a very considerable reduction—something between £3 to £4 a ton in the value of our ore.

The cost of mining and sorting has gone up and also freight and treatment—the latter item being owing to slightly increased terms made by the smelters upon the 1st January last. The ore obtained has assayed : galena, 81 20z. of silver, and 63 per cent of lead ; and the carbonate 46oz. of silver, and 29 per cent of lead. This lead question is, of course, one of the things we have had to contend with ; and another was the great difficulty in getting smelting facilities. Last year all the contracts which were made per year, expired ; and the American smelters would not take contracts for smelting except on impossible terms. Practically they succeeded in closing down a great many mines. We were fortunate in being able to make a contract with the Hall Mines smelter, and they have been acting as our smelters this year. The difficulties with regard to smelting, and the drop in the price of lead, has all the effect of closing nearly all the Slocan properties.

Of course the accounts deal with the past. Now with regard to the present and the future of the mine, which is the most important thing for the shareholders to consider at the present moment, you will see from the accounts that, as I have told you the creditors—consisting largely of the bankers' overdraft—have gone on increasing. The bankers' overdraft is in round figures £4.000, and naturally we look upon this as a very critical time in the history of the company I should like to read you some extracts from a report by Mr. Woakes, the engineer It is too long to read in full, but I have had some extracts made which will give you a very good idea of what the present position of the mine is. The report is dated 5th October, 1901. He says :— 'Unfortunately we have not yet met with the success which we hoped, and we believed, with reason, that we should meet. Two years ago it was decided to start a lower tunnel, for which there was a

good site, and which would cut the vein at a depth of 400 feet below the level of No. 5, the then lowest tunnel. At that time there was sufficient ore opened up in the mine to have paid the shareholders a small dividend, had it been decided to extract and realise it as quickly as possible. After that had been done, however, fresh capital would have to be raised for developments, or the mine would have to be abandoned. There was a good showing of ore in the sole of No. 5 tunnel, and a shaft had been sunk on it for a depth of about 70 feet, but had then lost it owing to the vein flattening out, so that the shaft was left in the footwall. The company, on my advice, decided to apply all the proceeds of the mine to the driving of the lower or main tunnel. . . . A small air compressor for the drills and hoist, and a ventilating fan, were installed, and uninterrupted progress was made with the main tunnel until it reached a length of 1,700 feet, where it was expected to cut the vein. There, however, a heavy stream of water was tapped last January, and has continued to flow ever since, so that the main tunnel, although in the immediate vicinity of the vein, as our other workings indicate, has never yet been driven into it. No. 9 level is only 60 feet above the main tunnel, and here we are now driving on the vein. In April last connection was made from the main tunnel by a raise to the bottom of the shaft sunk from No. 5 level, and cross-cuts and drifts started on the vein at four new levels, viz.: Levels No 6, 7, 8, and 9. In No. 6 level the ore shoot was found and followed north and south, and has since been stoped out, and up to No. 5 level this has yielded by far the greater proportion of the ore mined during the past year. Below No. 6 level the ore is now being taken out with the chief object of following the shoot and finding, if possible, its direction. . . . At No. 7 level the vein flattens out—a by no means unusual occurence at Queen Bess—for a distance of about 80 feet, as far as we have gone at present, and the slate hanging wall is replaced by a dyke rock, and as far as we have gone at present no ore has been found after this change takes place. . . . Very little mining has been done so far in the Slocan district, and the Queen Bess mine is in much the same condition as most of the other larger and older mines of the district, several of which have started deep tunnels since this company commenced theirs, but none of them are in as forward a state as the Queen Bess. It is almost impossible to suppose that the ore shoots do not continue in the veins. . . . The fact that the Queen Bess vein carries ore of such a high grade, and that so much development work has been already done with a view to opening out the mine in depth would seem to warrant the continuance of these works until the character of the vein in the lower levels is fully ascertained."

I will also read a short extract from a letter received from Mr. Woakes, dated 14th October. In it he says:—"At the mine, levels No. 8 and 9 have been continued north, both being in the same class of ground, the vein being narrow and not very well defined. As these two levels are so close together, I have now stopped driving No. 8 and put the men to drive No. 7 as, should the ore shoot have dipped away to the north, this should be the first level to get into it again in that direction. We have one man following up the vein from the crosscut raise put up from the shaft, halfway between levels 6 and 7. This was the lowest point at which we found traces of ore. We are rising on vein here, and expect to come out under the station at No 6 level. Here we had quite a nice bunch of ore, but evidently it does not extend down to any great depth. Your best prospect of finding ore appears tobe to drive north on the vein, below where the last ore was found. . . . We have got in a supply of firewood and mine timbers sufficient for the winter, and all the dumps and tunnels' mouths fixed up. In case of a shut down it would entail considerable expense to get things into shape again. . . . It may interest you to know that the Idaho people have traced their vein over the hill to the place where we opened up the vein by ground-slucing on the Young Dominion this summer."

That will give you a very good idea of what the position of the mine is, and what Mr. Woakes thinks of it. He is coming over here in December, and we shall be able to consult with him as to the steps necessary to be taken for the future. In the meantime, we have made temporary arrangements by which we shall receive the cash necessary to carry on the mine for another three months for the purpose of exploration only with a view to proving the ore at depth. But undoubtedly in my opinion and in the opinion of my colleagues, more capital will be required even when we do find the ore; but as to that we have, of course, nothing to put forward at present. We hope that we shall be more successful than we have been. Of course it has been a great disappointment to us not to get the ore in lower levels. I now move that the directors' report and statement of accounts be received and adopted.

MR. DRUMMOND seconded this.

The resolution was carried unanimously.

Enterprise (British Columbia) Mines.

An ordinary general meeting of the Enterprise (British Columbia) Mines, Ltd., was held on 1st instant at Cannon-street Hotel, London, E. C., Mr. Richard Popkiss, the chairman of the company, presiding.

Mr. E. R. Tasman (the secretary) having read the notice convening the meeting, and the report of the auditors.

The Chairman said: You will observe that the profit shown by the accounts amounts to £5,908 6s 10d., or nearly £6,000, which I think you will agree with me is satisfactory considering that in these accounts are charged the whole of the administration and other expenses both in British Columbia and London, for something over one and a half years, and especially so as during that period the unfortunate miners' strike did not allow of mining operations being commenced until early in March, 1900, thus reducing the working of the mine to a limit of about nine months, and even during that period shipments were reduced down to about 20 tons of ore per week immediately after it was found out that mechanical treatment of the ore would be advantageous, which small shipments you will naturally understand could do no more than help to pay the expenses. As explained in the report, this profit has been expended in the concentrating mill and other capital charges, and consequently is not available for distribution. This property was acquired by your company from the London and British Columbia Gold Fields, Ltd., and was purchased by that company upon the advice and reports of their engineers, who were of the opinion that the ore could be hand-sorted without undue extravagance or loss. It was therefore some surprise to us to find that from actual work such was not the case. However, as soon as this was discovered no time was lost in making arrangements for the erection of a suitable concentrator which would deal with it, but to do this meant the acquisition of a new site and the designing of the most suitable machinery for the particular class of ore it would have to deal with. This naturally absorbed some little time, and the winter intervening prevented outside building work being carried on until the spring of this year, when all possible expedition was used, with the result that I am now able to inform you that the mine and mill are now working, and your directors have no reason to doubt that they will continue to do uninterruptedly from now on. A complete compressor plant, operated by water power in the same way as the concentrating mill, has been installed, which again saves labour, and whilst expediting that work will reduce the expenses of mining. All the necessary buildings for the manager, the staff and workmen have been erected. The road between the mill and the point of shipping has been put in good order, and consequently we have to-day a mine fully equipped with every necessary requisite for the most economical and continuous working. The vein runs from a few inches to 2 ft. in width, which may appear to you as somewhat narrow, but I would remind you that it is of an exceptional richuess. In places this argentiferous galena is mixed with quartz, and it is for the purpose as far as possible of eliminating the quartz from the galena before sending the same to the smelter that the concentrating mill is required. This ore, we were informed in August last, would be sufficient to supply the mill with 50 tons daily for nearly two years, which reduced to tons amounts to some 25,000, and as our latest report states further good ore is still being opened up, there appears to be no doubt as to the future: Therefore, gentlemen, all I can do is to suggest your following the monthly returns as they are published, and in doing this you should bear in mind that those for the first two or three months will be less than we have every reason to expect them to be from month to month after that time. I will now ask Mr. Wethered to give you any further information which may occur to him, as he has come fresh from the property, where he saw the mine and mill in fact, all the works—and where he had the opportunity of discussing the whole question with the local administration on the spot. I will now propose the resolution: "That the directors' report and statement of accounts to December 31, 1900, now submitted to this meeting be, and the same are hereby, adopted."

Mr. Oliver Wethered seconded the motion. He said: I am going to deal with three or four of what I think are very vital points, and these are first the ore reserves. As you will see, on the authority of the mine superintendant, some months ago we had sufficient ore blocked out for practically two years. Since then I am able to testify, from having seen the mines, that the developments have been on a large scale, and perhaps better, I think I may say, that at any time during the history of the mine, so that on the point of development everything is as we could wish. I do not hesitate to tell the shareholders that from to-day on we should be, and, in fact, are to-day, making profits. There is nothing rash in that statement, because we have so much ore blocked out of a payable value that profit and not loss must result. What that profit is going to be will depend very much on the facility with which it concentrates. I do feel that, although it is wise that the directors should be reticent, or be very careful of propheysing. yet there is an obligation on them also, in a company like this, where the past has been so very disastrous, to tell frankly what we do think, and I therefore repeat somewhat more emphatically than I have stated in the report that I am perfectly certain that we are going to make fair profits from the very start, and that when all our machinery is adjusted, and when we know the best method of concentration, profits will be on a scale which will have earned large dividends to the shareholders. No man can see into the earth, and it may be that after we have worked up our two or three years' reserves, we should not find the same ore, but that is one of the very remote contingencies. I have never yet seen a vein which to my mind looks more like running than this one does.

The resolution was then put to the meeting, and unanimously agreed to without discussion.

Mr. Oliver Wethered proposed the re-election of Mr. Richard Popkiss as a director, which was seconded by Mr. Arthur Bell, and agreed to.

On the motion of Mr. Winnall, sceonded by Mr. Goring, Messrs. Monkhouse, Stoneham & Co. were appointed auditors for the ensuing year.

The proceedings then terminated.

Hall Mining and Smelting.

The second ordinary general meeting of the Hall Mining and Smelting Company, Ltd, was held in London last month, Lord Ernest Hamilton (the Chairman of the Company) presiding.

The Secretary (Mr. A. E. Ashley) having read the notice calling the meeting.

The Chairman said: Gentlemen —I think it is possible that the report and balance sheet before you may to some of you who only read it superficially, convey rather a wrong impression. I think it may convey an impression that the affairs of the company are less prosperous than they really are. If this impression exists among any of you, I hope before I have done this morning to be able to dlspel it.

Now, your business, as you know, is divided into two departments mining and smelting. You will remember, perhaps, that we looked to the smelter to pay the expense of developing the mine. Of course. it has been very far from doing anything of the sort. Almost from the first moment of our commencing smelting operations, we had to face a fall in the price of lead and silver which is quite without parallel in recent years. We did not practically begin to smelt until the end of October. though we had to buy ores previous to that date. I take up the official returns of the price of lead in London during the six months, and I find that in October, 1900, which is when we began lead smelting, the price of lead was £17 11s. 11d. a ton; in

November it was £17 4s. 7d. a ton; in December it was £16 4s. 8d. a ton; in January, 1901, it was £15 18s. 6d. a ton; in February it was £14 13s. 4d.; in March, £13 7s. 7d.; in April, £12 8s 5d.; and in May, £12 5s. 6d. You see there was a steady and persistent fall in the price of lead, and in the price of silver it was very much the same, and this hit us very severely in two ways, both directly and indirectly. Directly it hit us in a way you can all understand. Ore has to be bought for the smelter it is bought on the basis of the price which exists at the moment of purchase. The ore is then subjected to a certain process which covers several weeks, and at the end of the time the product is sold on the basis of the price which rules at the moment of sale. So that is apparent that if between the date of the purchase and the date of the sale you have a steady and persistent drop in the price of metal, you have not the basis for a very profitable undertaking. We estimate that in a direct way we have this year lost over £10,000. However, it is probable that indirectly this fall in the price of the metals has hit us even more severely.

You must bear in mind, in considering the situation, that the condition of things we have had to face has been quite an abnormal one, and that it is not in the least likely we shall ever be called on again to cope with such a steady and persistent fall in the price of the metals. However you must understand that this is a risk which is inseparable from the smelting of public ores; with regard to what I have called the indirect loss, that is to say, the loss arising from the shortage of the supplies of dry ores, I think we can easily safeguard ourselves against any repetition of loss in that direction. You must also bear in mind, of course, that if prices were to rise in the same way that they have fallen during the past financial year our profit would be correspondingly increased. Now as to the future. Our representatives on the other side have in view an arrangement both as regards the supply of dry ores and as regards the disposal of our lead bullion, which shows a marked improvement on the arrangements which have existed hitherto, and as we have now only one furnace running on lead, it should be a comparatively easy matter to obtain a reasonable amount of dry ore to keep that one furnace perpetually in blast whilst the smaller furnace is at work on our own copper ore. I want you to realise how very greatly the starting of copper smelting has relieved the position all round. It has not only enabled the copper-smelting department itself to make a very useful profit, but it has enabled the mine to make what I think one may fairly term something more than a useful profit.

In this connection you may notice in the report that during the three months ending 30th September the profit from smelting is estimated at £4,000, which is considerably better than anything we did during the past financial year. I turn from the smelting to the mining department, and here, at any rate, I do not think there is the slightest need to introduce the word "failure" in any sense. I think you will agree with me that the work which has been done at the mine since Captain Gifford took it in hand is really quite remarkable. At the time we took the mine in hand there was practically not a single ton of ore in sight. Active work was not begun at the mine before the installation of the new machinery, in January of this year, but since that time up to the 30th of September he has sent down 14,543 tons. Now, since the 30th of June, you will see from the report, that 9,300 tons of ore have been smelted, and that the net proceeds from these amount to nearly $102,000, and we estimate that after deducting working expenses at the mine the net profit to the whole concern on that figure is £12,500. We have since received a cable that for the five weeks ending the 25th of October the output has been 3,864 tons, of an average value of 27.32 ozs. of silver per ton and 6 5 per cent. of copper. These two periods overlap one another to the extent of a fortnight, but we calculate that by this recent cable from the mine manager we may add £6,000 net profit to the £12,500, which you see appearing in the director's report, making the net profit on mining up to date £18,500 since the 1st of July. Of course, you must take these figures simply as an estimate.

The amount spent on development during the year is £24,728. The amount of ore developed during the year is 25,143 tons, of which 5,243 tons were extracted and sent down. The way we arrived at the adjustment of the proper proportion of the amount spent on development to profit and loss and to development account is as follows:—As 5,243 tons, which is the amount extracted, is to the total amount developed, 25 143 tons, so is the amount which we charge to profit and loss account to the entire amount spent on development during the year. I hope I have made that clear. That, we think, is as fair and proper a way of arriving at an adjustment as we could find, and it is a method which we propose to follow in each subsequent year. I have nothing further to say, except to move the adoption of the report and balance-sheet.

Mr. George Freeman seconded the resolution, which, in the absence of any questions, was put and carried unanimously.

A vote of thanks to the Chairman closed the proceedings.

Coal and Iron in Cape Breton.

As a matter of interest to those concerned in Canadian development, we publish the notes of a well-known British iron-master, Sir Christopher Furness, on the Dominion Iron and Steel Company's plant in Cape Breton. We find these in a letter published in the London *Colliery Guardian* of November 8, the substance of which is given below:—

"In Cape Breton I have visited the whole of the works and collieries, and was struck with the magnitude of the undertaking, also the comprehensive and thorough manner in which everything is being carried on. There are two separate companies, one owning the collieries, about 50 miles of railway, and the port facilities; the other company owning the steel plant and the large number of coke ovens of the Otto-Hoffman type, very different from our old-fashioned, out-of-date beehives The site chosen by the company is, in my opinion, unparalleled. They have an extensive frontage to the harbor, and for a considerable distance beyond the site of the steelworks is a natural inner harbor. At the piers they have built, the depth of water is 35 to 40 feet, and on these piers they have erected most up-to-date steam and electrically driven machinery and contrivances for rapid loading and discharging. The ore is brought from Wabana, where it exists in enormous quantities, and where vessels of 6,600 tons are loaded in 7 to 8 hours, making the return voyage in 30 hours, and the discharge is then effected in 7 to 8 hours, all of which figures I have verified by the logs of a captain of a 6,600 steamer discharging here. After discharge, the ore is carried from the discharging wharf to a heap and pockets about a quarter of a mile distant, opposite the blast furnaces, from which it is run on a belt and carried up. The steelworks are not yet complete; but they already employ in the present condition of affairs 3,500 men and cover about 250 acres The coke ovens (of which there are 400) and blast furnaces are working, but I find with regard to the by-products, such as tar and sulphate of ammonia, they have yet to find a satisfactory market for the whole of these. The rolling, rail and plate mills are still in course of construction, and some little time must elapse before they are able to make a full quantity of steel plates and rails. Pig iron they are shipping in steamers carrying about 4,500 tons to Glasgow at a freight of about $2 per ton, and at a lower price than Cleveland is shipping to that market.

"The details of the coal production will undoubtedly prove more interesting. They possess 160 square miles of coal-producing land, and computed roughly to contain 5,500,000,000 tons of coal. At present five pits are being worked, in addition to which they have nearly completed two more shafts, one at a depth of 860 feet, and the other 840 feet, which will produce over 6,000 tons per day, one 3,500 per day, the other about 3,000, making a grand total when all the pits are working of 16,000 tons per day. The men work every day except Sunday. The supply appears to be without limit, and the difficulty I foresee for them is to find an outlet for their total production, so as to keep the pits fully running. Up to the present practically their entire production has been sold to Canada and the United States, but they must now find other outlets, and will be bound to enter into competition with our north and south country coal in the Mediterranean markets, and in this they are being assisted by the policy of the present Government at home in taxing our exports. They employ about 5,500 men and boys, using machinery upon which I do not see they could improve, so that what many miners in Durham and Northumberland do on their backs, they do by machinery. In the first pit we visited, they employ 850 men and boys underground, who raise 3,000 tons per day. The shaft is sunk to a depth of about 200 feet The coal is loaded below into trucks of 2 tons, which are hoisted to the surface, where, on arrival, they automatically tip on to a broad moving belt, on either side of which are two men. The coal slides on the screen, then on to what is termed the 'pickers' plate,' and from that down to the railway trucks. These trucks carry from 30 to 50 tons, and are taken along to the harbor, where they are shipped to the ports of Sydney and Louisburg, on their own railway. The average distance from either harbor to the pits is about 15 to 20 miles. In the second pit, the working is somewhat different, as the seam comes up very close to the surface. The car is loaded on to trucks carrying about 2¼ to 2½ tons, which are drawn up by an endless wire rope, and again tip automatically as described above on to a belt below, the truck, when empty, passing over the opening down a short incline on to a siding, where it starts on the return journey. The other pits are worked in one of these two ways, a difference being, however, projected at the new shaft, where the coal will be brought to the surface in trucks of 6 tons, the shafts being unusually wide. About 10 per cent. of the coal raised is gas coal, and the quality of their production is, they maintain, equal to any American coal except 'Pocahontas.' In conclusion, I may mention that the workmen, while they earn good wages, are able to turn out of the pits much more coal per man than we are able to do from any pit either in Durham or Northumberland. You will therefore see that with the advantages they possess of having acquired the land so cheaply (a large part cost nothing); with two splendid harbors; and no high railway rates for carriage to the water, also with an unlimited supply of coal, they are in a position to produce and deliver it f. o. b. at a figure quite out of the question for any of our collieries to compete with.

"Our railway companies in England will have to alter their methods if England is to hold her own in the industrial world. When I consider what the Northeastern Railway Company do, and compare their methods with those I see here, I realize our difficulties and deficiencies. Just fancy seeing 30 wagons carrying 50 tons each drawn by one engine, and then compare that with what is done on any of our Durham or Northumberland lines.

"I omitted to state that the seams vary from 7 to 10 feet, and the company can deliver the coal f.o.b. at less than $1 per ton. The steel company will be able to make pig at less than $6 per ton, steel blooms less than $10 per ton, and steel rails at about $12, so that you will see what we shall have to contend with. The ore runs about 50 to 52 per cent, and can be put into the works at about $1.16 per ton. Ore is being sent abroad from Bell Island containing the above percentage.

COMPANY NOTES.

Le Roi No. II.—The manager cables 5th November:—"Monthly shipment of ore 4,456 tons. Contents 2,151 ozs. gold, 5,500 ozs. silver, 100 tons copper. Gross approximite value $79,000. Estimated profit $29,000."

Bosun Mines.—Telegram from the manager reports returns from smelter for 60 tons of galena shipped during the mouth of October, $1,946.

B.C. Exploring —Under date, 9th inst., Captain J. Argall states:—"Kamloops—The large lode, 40ft. wide, to the hanging wall shows up very fine and will average fully 6 per cent. copper throughout, with fair values in gold and silver. We have sold up to date approximately $2,000 worth of ore. Frederick arm—We have encountered the ore body in the rise over No. 4 tunnel at 92 ft. This shows the ore to come down below No. 3 a distance of 77 ft., and then dip quite flat north-west into the mountain. We hope to connect this rise with the winze sinking below No. 3 within the next few days when we will be better able to decide the nature of the lode and where it may again be encountered in No. 4; at present, to say the least, it looks distinctly encouraging."

Ymir.—"During last month 80 stamps ran 704 hours (29 days 8 hours). Estimated profit on operating is $25,900 (£5,340)."

Hall Mining and Smelting. — Output of Smelting ore from the "Silver King" for four-weekly period ending 21st October, 3086 tons, averaging 27.78 ozs. silver per ton and 6.50 per cent. copper. Approximate gross value of contents £19,150.

Whitewater.—Cablegram from Kalso, British Columbia :—"During last month 4,900 tons have been milled, producing 483 tons of concentrates. Returns from smelter amount to $9 250. The working loss is $45 this will include fire insurance for the last half of this year, also taxes on ore extracted since the month of December. At present the ore production is increasing; the quality is improving."

The London and British Columbia Goldfields.—Cablegrams received from the Chairman, Mr. Oliver Wethered :—

"*Eva Group* (*Lardeau District*).—Present prospects do not justify any further expenditure whatever.

"*Enterprise.*—Everything gives me the greatest satisfaction. Fowler's opinion is, never looked as well as at present. Hope to start Concentration Works Compressor in about 20 days.

"*Whitewater Mine.*—Is looking well. I cannot estimate what is the margin of profit until three months' steady working.

"*Ruth.*—Prospects are undoubtedly good."

Velvet (Rossland)—The general manager cables:—"Have cut vein adit level. The main shaft has been sunk to a depth of 406 feet. Have obtained ore high grade at No. 5 station along the footwall. Am not able to cut right through lode until completion of station."

Granby Consolidated.—It is expected now that the work of enlarging the Granby smelter to the capacity of 1,300 tons per day will not be completed before January 15th. The first instalment of two new furnaces, whose construction was delayed owing to machinists' strike in Chicago, reached here today. The balance of the sampler machinery has also arrived and is being put up. The new plant for the power house will be available as soon as the intake pipes are connected with the water flume. The task will not occupy more than a few days.

British Columbia Copper.—The company's mine is producing from 350 to 400 tons of ore daily. More stopes were opened at the 200-ft. level in October, and at the 300-ft. level the new plan of working by the pillar and stope system is now well advanced. The north drift, at the 300, is now about 490 ft. from the shaft. Three quarries in ore are worked from the surface. A machine shop has lately been put in equipped with planer, drill press, lathe, steam hammer, emery grinder. A Farrel rock crusher, with a capacity of about 800 tons, crushed to a maximum size of 6 in. in ten hours, has been ordered for the mine and a 90-h.p. Jenckes Machine Company's engine.

Consolidated Lake Superior Co.—At the adjourned annual meeting in New Haven, Conn., on November 18, the president reported that over 90 per cent of the stock of the Ontario-Lake Superior Company had been exchanged for the stock of the Consolidated since October 6, in accordance with the terms authorized by the stockholders. Directors were chosen, as follows: Edward J. Berwind, William L. Bull, and Charles E. Orvis, New York; H. A. Berwind, James Butterworth, W. P. Douglas, F. V Douglas, John S. Freeman, Edward C. Lee, F. S. Lewis, John Pitcairn, S. M. Provost, Samuel Rea, T. C. Search, and James S. Swartz, of Philadelphia; F. H. Clergue, of Sault Ste. Marie, Ont., and Lynde Harrison, of New Haven. More than 590,000 shares of stock were represented at the meeting by proxy and 65,36 shares by stockholders present.

Baltimore & Nova Scotia Mining Co.—This company, successor to the Guffey-Jennings, late owners of the Lake Lode Mine, Caribou district, has the vertical shaft down 650 ft. The Company will probably not tap the lode again, until 750 ft. A winze has been sunk on the slope 300 ft. west of the shaft on the 500-ft. level to a depth of 90 ft. The vein here maintains its width and values. A large amount of other development work has been done.

Another vein apparently equally as valueable as the Lake lode, has been opened 700 ft. south, and is tapped by shallow shafts in 6 places, proving continuity for 1,100 ft.

The company will have in operation in some 6 or 8 weeks a 40-stamp mill, with all modern improvements, and will probably cyanide the tailings. The cost of the mill will be about $60,000. A 14-drill compressor is being installed at the head works. The principal owners are Baltimore, Md., men. The general manager is L. W. Getchell, and the secretary-treasurer is A. S. Dunham, of Boston.

Miocene Gravel Co.—Up to date over $200.000 have been spent by the company in exploiting auriferous gravels in the old river beds at Harpers' Camp, Cariboo B.C. The bed-rock has proved to be deeper than was anticipated, and it has required a shaft 550 feet deep to reach it. It has now been reached, however, and but for the quantity of water to be handled, drifting would have been carried on during the past year. Mr. R. H. Campbell, who is in charge of the work, has been able, however, to test the ground and he has now assurance that in richness it will come up to his expectations, and yield ample reward to those who have provided the capital for the Company's operations. Mr. Campbell will complete the plant during the ensuing Winter, and before many months elapse he expects to be bringing up gravel. He states that he will be able to handle about 500 tons a day, and at a very moderate estimate of gold to the ton of gravel, the result to the Company will be a very handsome profit.

Jewel Gold Mines, Limited.—Sinking the new shaft of the old workings is being pushed on, as is the running of cross-cuts at the 230-ft. level. Ore bins are being constructed, and ore is being hauled 4 miles to the railway, whence it is shipped to the smelters of B. C. Copper Company at Greenwood, and the Granby Company, at Grand Forks.

B.C Chartered Company.—The ore shipments from the B.C. Mine to the British Columbia Copper Company's smelter, at Greenwood, during October totaled 3,750 tons. Prospecting from the lower levels of the mine with the diamond drill proceeded.

St. Eugene Consolidated.—There has been no change in the working force during the past week. There are 50 men engaged in development, 15 on the hill and 35 in the lower tunnel and shaft. The deep shaft is down 150 feet and in a few days cross drifting will commence.

Ymir.—Mr. Oliver Wethered, of the London & B.C. Goldfields, in a letter to the board of the Ymir Gold Mines, Ltd., gives a very gratifying statement of his opinion of the great value of the Ymir mine. The long tunnel, he states is in a distance of 1,500 feet out of a total of 2,100 feet and progress is being made at the rate of 150 a month. The shaft is down 700 feet and at 1,000 feet will intersect the long adit tunnel. As to the value of the ores the monthly remittances speak for themselves, and stoping has been done only down to the third level. All these results have been obtained from but a small portion of the property so a crosscut is being run from the shaft to intersect the vein on the Mugwump claim. The 80-stamp mill is doing excellent work and when the cyanide plant is completed, which will be about the end of the year, a greater quantity of ore can be put through as the coarser screens can be used. He advises the installation of more water power which has already been recorded.

Le Roi.—Returns for October :—"9,737 tons of ore shipped to Northport Smelter, containing 3,341 ozs. gold, 6,023 ozs. silver, and 131 tons copper. In addition 5,925 tons of ore from the dump were treated at the Trail Smelter, yielding a profit of $24,603."

The British Columbia (Rossland and Slocan) Syndicate.—In anticipation of the fourth ordinary general meeting, the report and accounts for the year ending December 31 last have been issued. The whole of the expenditure having been out of capital no profit and loss account has been prepared, but the company is now well equipped with funds. Of the nominal capital (£100,000) 47,423 shares are fully paid, and 33,721 shown are 12s. 6d. paid up. During the year under review the syndicate's energies have been principally devoted to the development of the Snowshoe Mine, and the work has progressed with most gratifying results. One additional claim, the "Pheasant," and two fractions, the "Fairplay" and "Alma," were purchased, and, together with the "Snowshoe," comprise an area of about 120 acres. The Snowshoe Group has been sold, however, and floated as a separate company. The St. Elmo Mining Company, in which the syndicate owns 1,000 shares, reports satisfactory progress, though it was somewhat retarded by the late Rossland strike of miners. In the substantial block of freehold building land in Rossland, the syndicate possesses a good property, but the directors decided not to deal with it in any way on account of the progress of the city of Rossland being somewhat thrown back by the labor troubles, now over. The Goat River group of claims, which were under option to the syndicate, have been purchased, and the work necessary for Crown granting proceeded with. It was again decided this year to postpone the payment of the directors' fees. Regarding the syndicate's interests in the Yukon District, the principal work has been confined to the Whitman Gulch claims, which are favorably reported upon, as well as with regard to an hydraulic mining location, three miles in extent, on Uplands Creek, for which the syndicate has made formal application to the Government at Ottawa. Captain A J. Corse Scott has resigned his position as a director, and the Board have elected Mr. Charles F. M. Scarisbrick, a large shareholder, to fill the vacancy.

Golden Crown Mines, Limited.—At a recent meeting, held a few days ago at Brandon, Man., it was decieed to reopen the property, located 5 miles from Phœnix, adjoining the Winnipeg. The following directors were elected :—Judge Cumberland, president; G. R. Caldwell, vice-president; Senator Kirchoffer. Andrew Kelly, Frederick Nation and J. B. Curran, of Brandon; William L. Parrish, of Winnipeg; C. E. L. Jarvis, of St. John, N.B., and W. A. Fuller, of Spokane The Golden Crown has not been working for about a year, pending reorganization. It has about 2,500 ft. of underground work done, has shipped in the neighborhood of 2,500 tons of ore, and is equipped with compressor and other machinery.

Granby Consolidated Mining and Smelting Company.—In a recent interview S. H C. Miner, president of the company, in a recent visit stated that the company is adopting the "caving" system, which hitherto has not been applied to copper mining except in Utah. By means of large open cuts the company can break down the ore and load it upon the car with steam shovels, thereby obviating all timbering and pumping, and reducing to a minimum the costs. It is stated that the present capacity of the plant is to be increased to 2,000 tons daily. Two additional furnaces are to be built at Grand Forks, and also a converter.

London & Richelieu Mining and Smelting Company.—B. C. Riblet, of Nelson, who has the contract for the tramway for the 10,000-ft. tramway, has 25 men busy and expects to have the tramway finished by December 15th. The waggon road, extending about 9 miles up from Crawford Bay toward the mines, is a good one, and when the tramway is completed the ore will be conveyed to the end of the road, whence it will be hauled in sleighs to the landing. It is expected that an average output of 50 tons per day can be maintained. On the last ore shipped a smelter rate of almost $14 had to be paid, but the company has just closed a contract with the Trail Smelter to treat 15,000 tons at $7 per ton for freight and treatment on the ore landed at Crawford Bay.

Cordova Exploration.—This gold mine, near Madoc, is shipping bullion regularly. An immense air compressor will be installed at the dam and compressed air will be conveyed to the mine in iron pipes. This will furnish abundant power for all operations in connection with the mine and mill, and will certainly make the Belmont a unique mine in Canada for working on a large scale most economically in every detail. One of the consulting engineers of the company from London, England, is here giving his assistance in the matter.

British-Ontario Gold.—This company has been floated in London, England, by Col. J. S. Hillyer, formerly of Duluth, Minn., and has leased the Alice A. Mine for 99 years The company agrees to mine 200 tons of ore daily. The directors are: Edward Coventry, London; Capt. R. B. Needham, Sussex; Col. W. S. Engledue, Tunbridge Wells; Col. F. McDonald, Surrey. The capital is £300,000.

Canadian Gold Fields —This company continues to ship regularly gold bullion and arsenic from its plant near Deloro. It is reported that the company has acquired a lease of the celebrated Dufferin Mine in Nova Scotia.

The Manitoba Union Mining Co.—This company, which was expected to work some gold mines in the New Klondike district of New Ontario, has been devoting its energies to the development of cement and gypsum deposits, the former near Miami, Man., the latter on the shores of Lake Manitoba.

Bosun Mines.—Secretary reports, under date 4th November, 60 tons galena shipped in October, value $1,946.

Fraser River Gold Dredging Company.—This company's dredge at Lytton is ready. Manager H. Graham had hoped to start it sooner, but owing to the delay in the arrival of machinery could not. Some new buckets have replaced old. The gold-saving tables and washing appliances have undergone extensive changes and repairs. Mr. Graham has with him one or two experienced New Zealand dredger men.

NEW COMPANIES.

BRITISH COLUMBIA.

Pontiac Copper Mines, Limited.—Incorporated 24th October, 1901. Authorized capital, $1,500,000; in shares of $1.00. Formed to acquire and work the "Pontiac," "Lady May," and "Kenilworth" mineral claims, situate on Red Mountain, in Yale District, British Columbia.

Atlin and Canadian Development Co., Limited.—Incorporated 30th October, 1901. Authorized capital, $1,000,000; in shares of $1.00 each.

ONTARIO.

Peat Industries, Limited.—Incorporated 16th October, 1901. Authorized capital, $500,000; in shares of $10.00 each. Head office: Toronto, Ont.

Log Cabin Gold and Copper Co., Limited.—Incorporated 23rd October, 1901. Authorized capital, $3,000,000; in shares of $1.00 each. Head office: Toronto, Ont.

Westerfield Mining Investment Co., Limited.—Licensed 23rd October, 1901. Authorized capital, $100,000. Head office: Geo. H. Draper, barrister, Rat Portage, Ont.

Canada Iron Furnace Co., Limited.—Licensed 31st October, 1901. Head office: John J. Drummond, Midland, Ont.

Algoma Queen Mining Co.—Licensed 7th November, 1901, as an Extra Provincial Company, to carry on the operations of a mining, milling, reduction and development company in Ontario. Head office: J. E. O'Connor, barrister, Windsor, Ont.

GREAT BRITAIN.

The Tyee Copper Company, Limited.—This company was formed in April, 1900, for the purpose of acquiring certain copper gold mineral claims on Mount Sicker, Vancouver Island, British Columbia, and known as the "Tyee," "Herbert" and "Magic Fraction" claims. These properties have been since, the present prospectus informs us, duly vested in the company, the consideration paid to the vendors, a development company, being 80,000 £1 shares. In April of last year a prospectus sought subscriptions fo 20,000 shares. These have been allotted and are fully paid. The company claims to have spent nearly £20,000 in further development and machinery, &c. It is now proposed to purchase a site for a smelter at $20 an acre, with the right to take water from an adjacent lake, and to acquire certain contiguous claims. The purchase price, which is disclosed as well as the names of the owners and the moneys they are each to receive, appears reasonable. Subscription is now sought to an issue of 80,000 £1 shares, upon each of which a commission of 40 per cent. is to be paid. Inasmuch as it is stated that the company's consulting engineer has made a calculation, from which a profit of 30 per cent. per annum should be made on the total capital of £180,000, and that a sufficient body of ore has been proved to keep the smelter employed for two years, those who are fortunate to get in on the ground floor should not do amiss.

Dominion Development Syndicate, Ltd.—Registered 17th October. Capital £1,000, in £1 shares. Objects: To acquire any lands, etc., in Canada or elsewhere, and to crrry on the business of financiers, contractors for public and other works and conveniences, company promoters, miners, ship-builders, railway and tramway owners, wharfingers, farmers, cattle dealers, etc. No initial public issue. Registered office, 11, Queen Vietoria Street, E.C.

MISCELLANEOUS

CANADA'S UNDEVELOPED ESTATES.—In view of the activity of American capitalists in Europe and the boundless ambition which appears to animate the industrail and financial giants of the States. the question of how far the capitalist of the States should be permitted to absorb the comparatively embryo industrial life of Canada is becoming a more practical Imperial problem every day. It was gratifying to hear the other day says "Financier," that a group of British financiers were endeavouring to acquire certain industrial interests in the United States as a measure of self-defence. Meantime, it should not be for an instant forgotten that the "undeveloped estate" of Canada is far and away the most precious asset of the British Empire.—*Science and Art of Mining.*

NICKEL MINING IN NEW CALEDONIA.—For the first six months of the year the mineral exports have amounted to 60,599,023 kilos of nickel, 3,767,691 kilos of chrome, and 2,272,656 kilos of cobalt. A rough idea of their destination is obtained from the figures for the seventh month. Of six million kilos (approximately) of nickel one and three-quarter million kilos went to France, and the balance to America. Two and a-half million kilos of chrome were disposed of to Holland and Australia in the proportion of about a hundred thousand kilos to the latter and the remaindr to the former. In the matter of cobalt, France took about two-thirds, and Australia one-third of a consignment of 126,000 kilos.

MINERS' PICK-BLADE CARRIERS.—Two or more blades are laid in the box in layers of two—the vertical key or plate is inserted in the slot on top and pushed down until its lower extremity rests upon the pick-blade, the swinging plate or locking bolt is pulled round so that it enters the slot in the key plate now standing opposite to it, thus forcing the key plate back against the side of the box and into the groove or guide provided the padlock or other fastener is passed through the hole in the bent-up end of the locking plate and through the hole in the handle plate or boss, thus securing the key plate and so the pick-blades.—*Colliery Guardian.*

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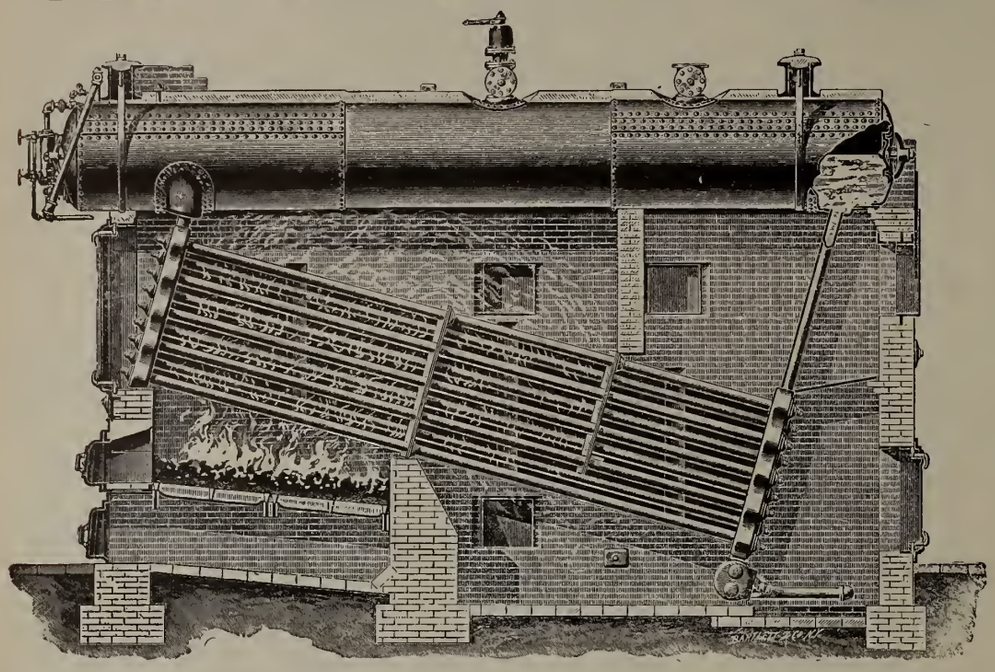

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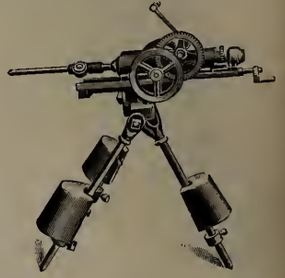

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OTTAWA, CANADA.

CALEDONIAN IRON WORKS

JOHN McDOUGALL, - MONTREAL, QUE.

BOILERS

TANKS AND WROUGHT IRON WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

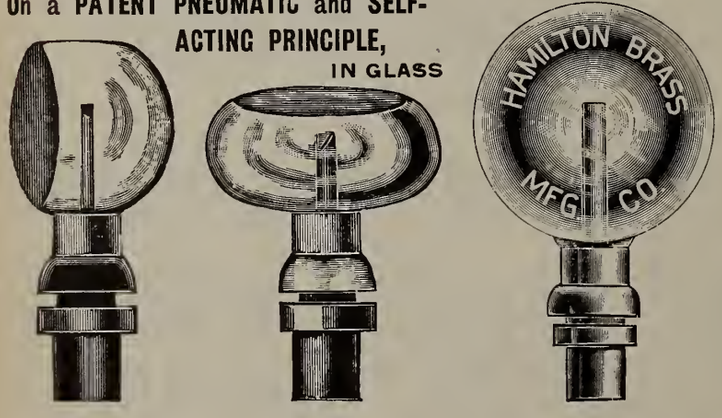
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS IN CANADA FOR **WORTHINGTON PUMPS**

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company

IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE, IN GLASS



INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

1st.—Free working of the machinery by perfect lubrication.

2nd.—A saving of more than 75 per cent. in oil.

3rd.—Corresponding economy in steam-power and coals.

4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

IMPROVED STEAM TUBE CLEANER.

THE CLEANER THAT CLEANS CLEAN.

No Moisture. No Scale. Saves Cost Quickly.

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THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON, ONT.

Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite: copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

HONORABLE E. J. DAVIS,
Commissioner of Crown Lands,

or

THOS. W. GIBSON,
Director Bureau of Mines,
Toronto, Ontario.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,
Commissioner Public Works and Mines,
HALIFAX, NOVA SCOTIA.

PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals ; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
PARLIAMENT BUILDINGS, QUEBEC, P. Q.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

AFFILIATED TO QUEEN'S UNIVERSITY.

The Following Courses are offered

1—Three Years' Course for a Diploma in

(A) Mining Engineering.
(B) Analytical Chemistry and Assaying.

2—Four Years' Course for a Degree B.Sc. in

(A) Mining Engineering.
(B) Chemistry and Mineralogy.
(C) Mineralogy and Geology.

3—Courses in Chemistry, Assaying, Mineralogy,

and Geology for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)
For further information see the Calendar of Queen's University.

4—Post-Graduate Course for the Degree of

Doctor of Science (D.Sc.)
For further information see the calendar of Queen's University.

Next Session begins October 3rd,
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Matriculation Examination held at Queen's University, Sept. 20th.
Unmatriculated Students admitted to Special Courses.

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory the operations of Crushing, Amalgamating, Concentrating, Chlorinating, Cyaniding, etc., can be studied on a large scale.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

Dr. W. L. GOODWIN,

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SCHOOL OF MINING, KINGSTON, ONTARIO.

Electric Blasting Apparatus.

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Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

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The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes, Blasting Caps, Fuse, Etc.

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Full Information obtained at the Above Addresses. Write for Prices.

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THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

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Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

MECHERNICHER BERGWERKS AKTIEN VEREIN MECHERNICH

RHENISH PRUSSIA, GERMANY.

Ore Dressing and Concentrating Plants

Specialty: MAGNETIC SEPARATION BY OUR OWN SYSTEM.
Patented in the United States and other countries.

Greatest efficiency, ample guarantees of success, and lowest cost.
Experimental works at Mechernich, Germany, and Neerpelt, Belgium,
Ores dressed and concentrated on trial for parties interested.

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L. VOGELSTEIN, 62-64 William St., New York.

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Coal and Ashes Handling Machinery

Freight and Package Elevator

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Endless Apron-Pan and Truck Conveyor

Elevator Buckets
Any size, shape or capacity.

Chains of Every Description

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Dump Cars,

Coal and Ore

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Coal Washing Machinery.

Logs, Lumber, Shavings, Refuse, Sawdust,
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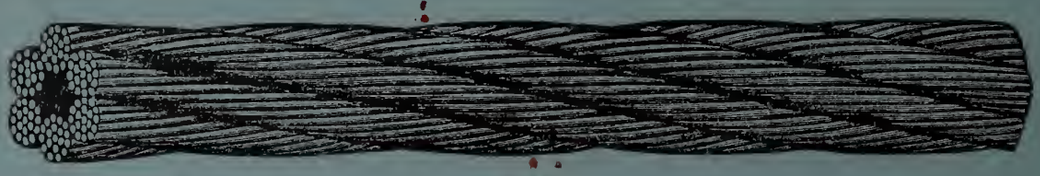
FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.



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Two Tanks in the Mine—
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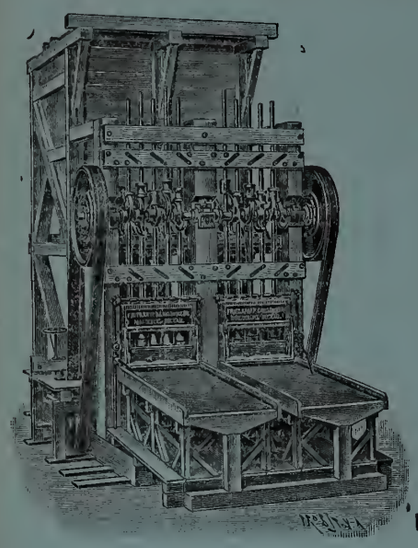

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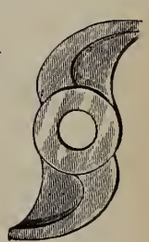

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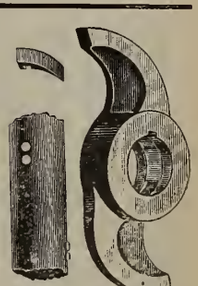

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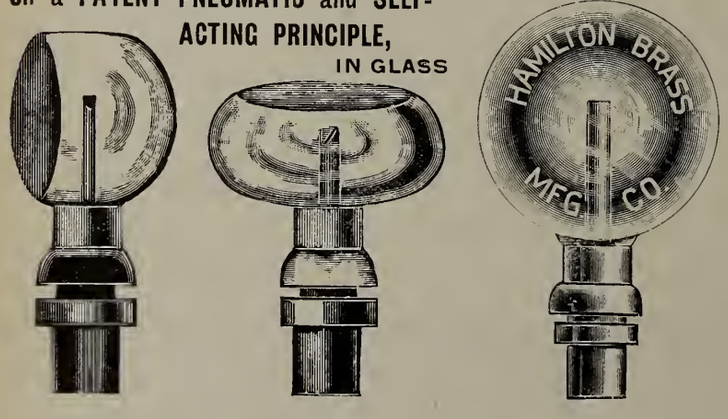

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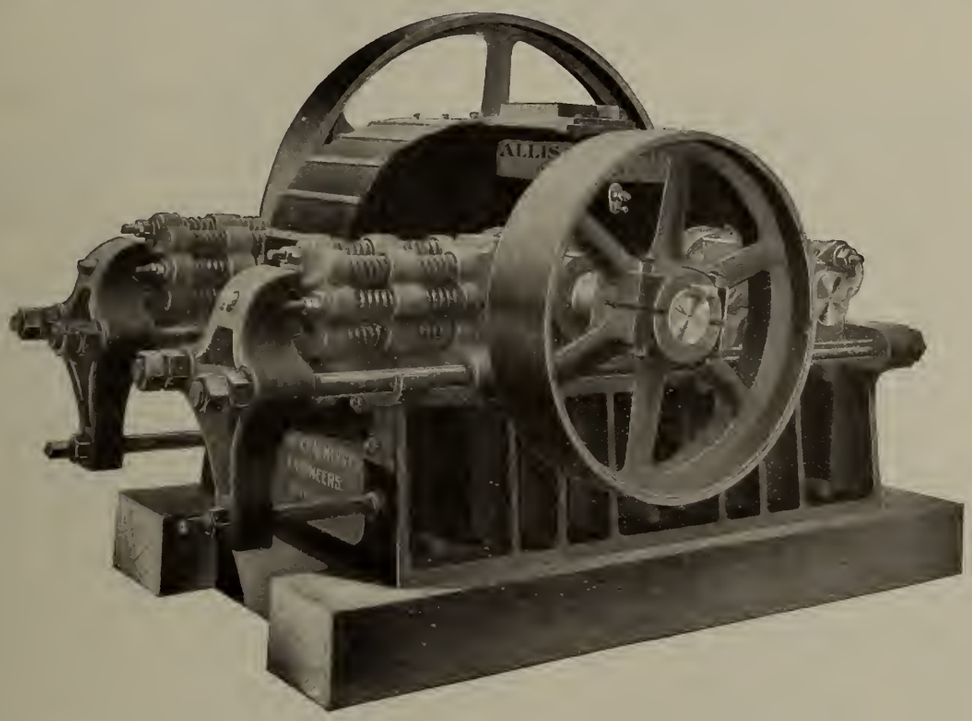

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These rolls are designed especially for heavy duty, they are very strong in every detail and provided particularly with very strong steel shafts and extra large bearings, the springs and tension rods are designed for the heavy pressure necessary to satisfactorily crush very hard ores.

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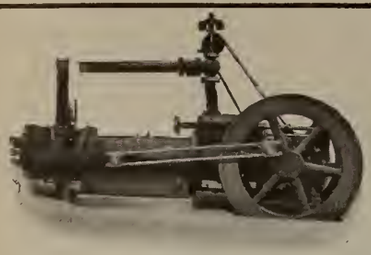

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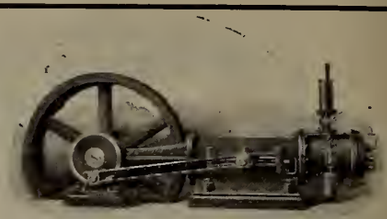

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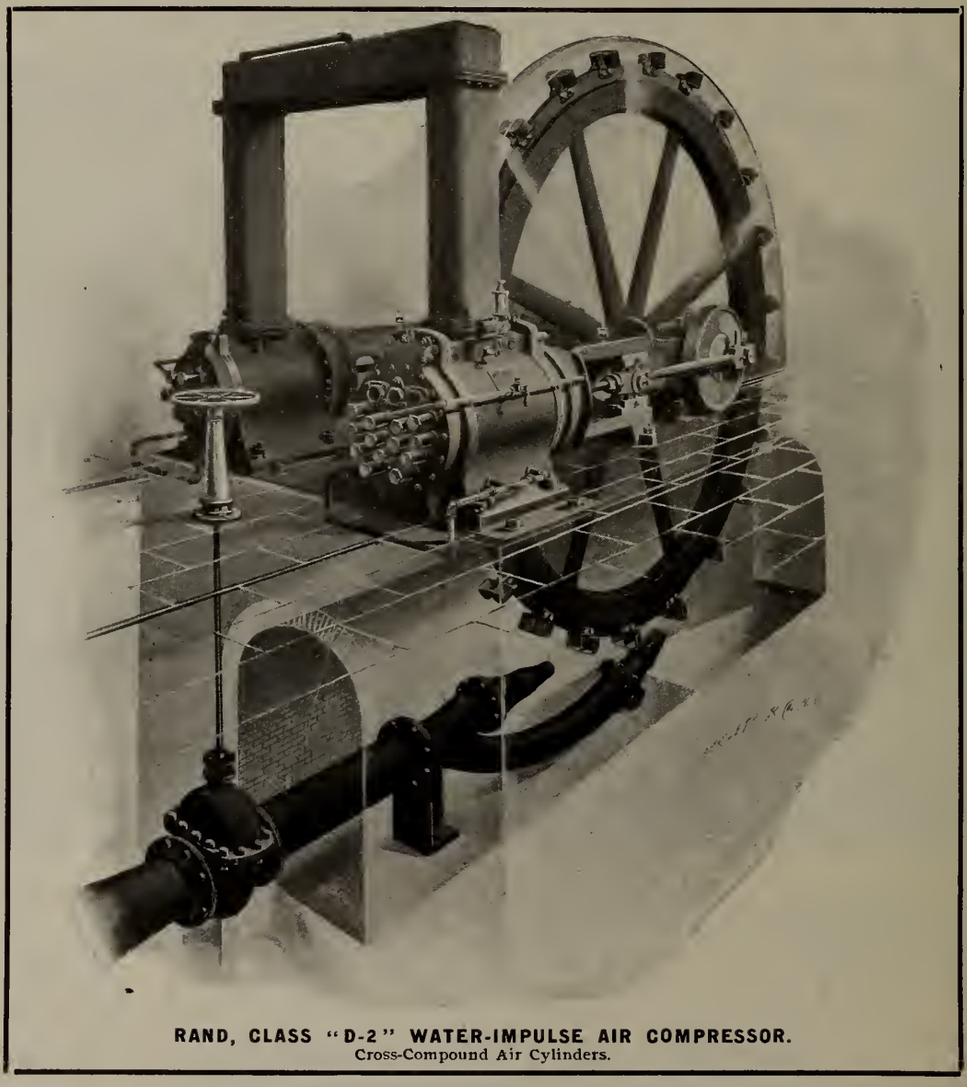

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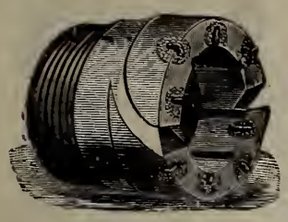

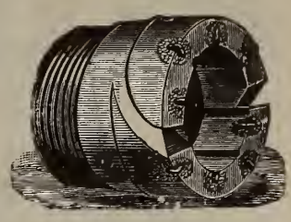

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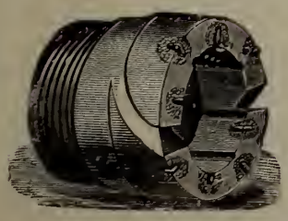

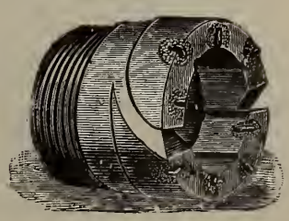

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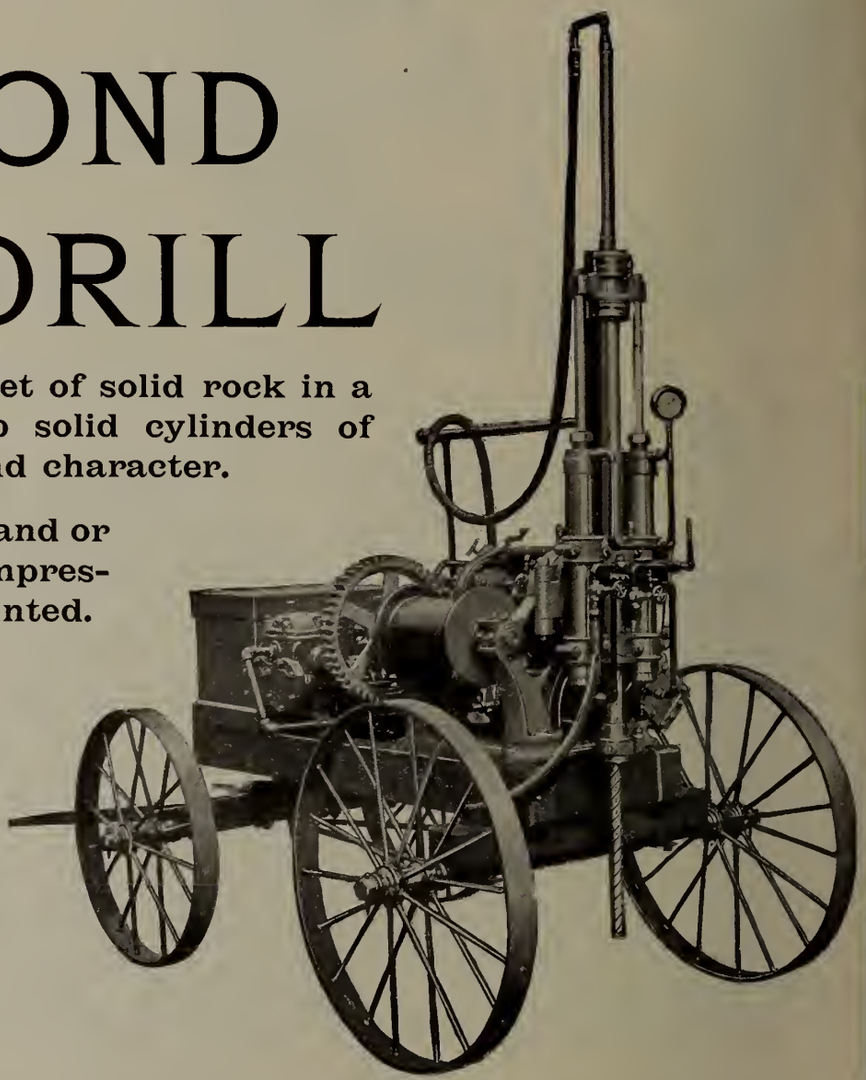

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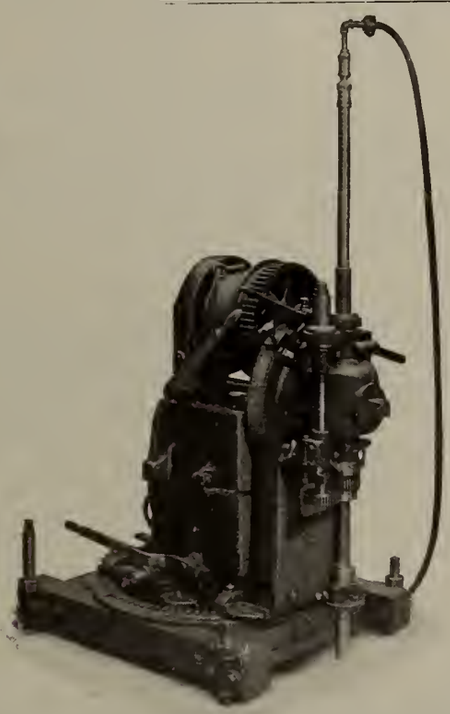

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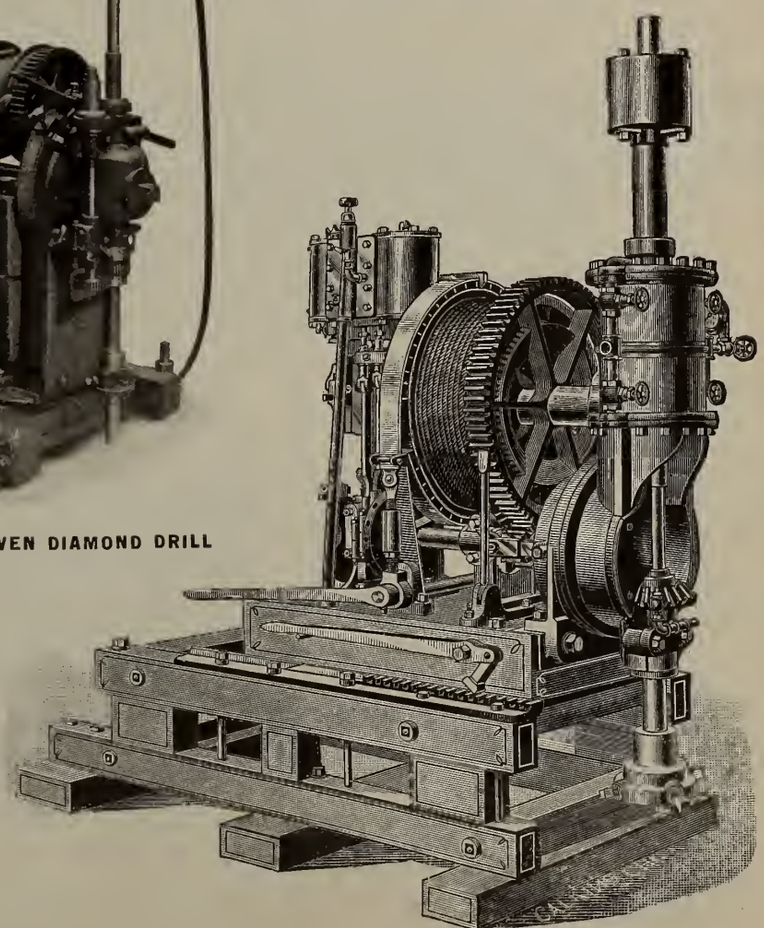

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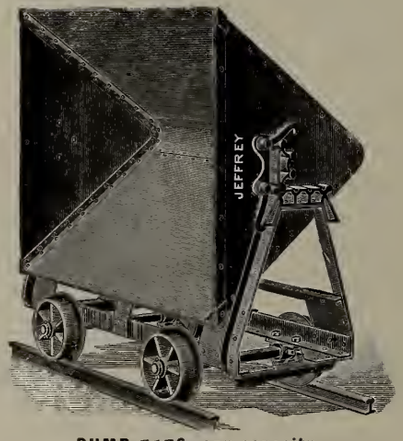

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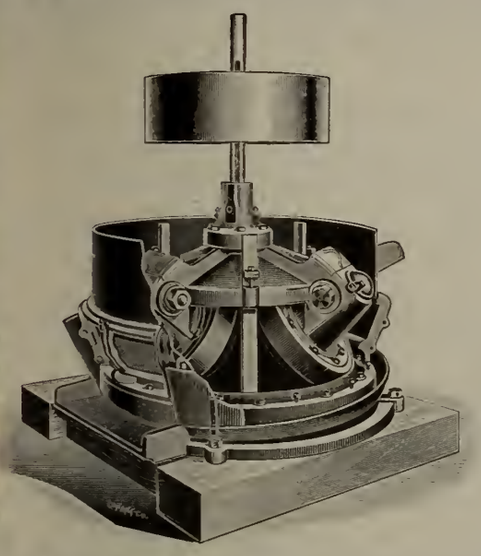

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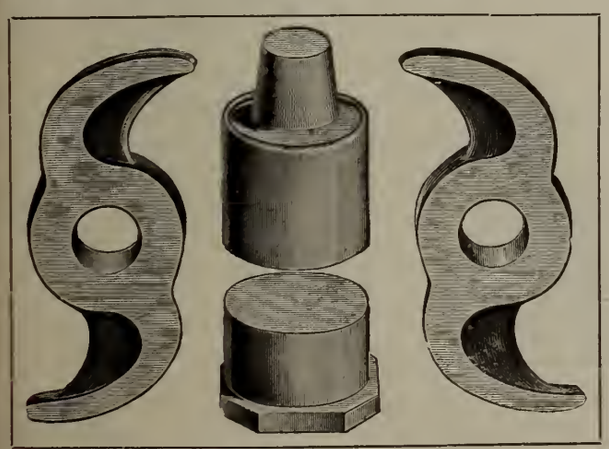

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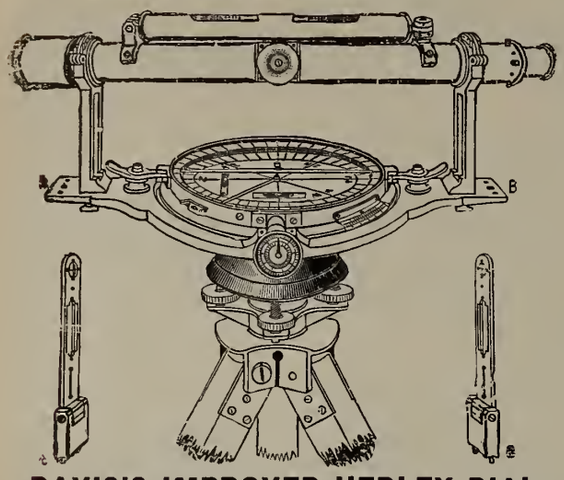

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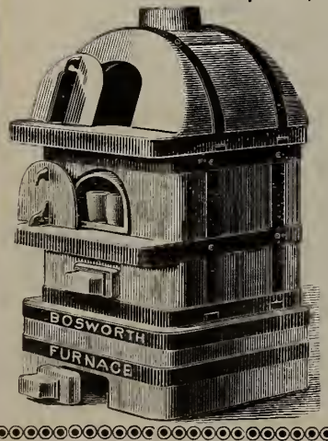

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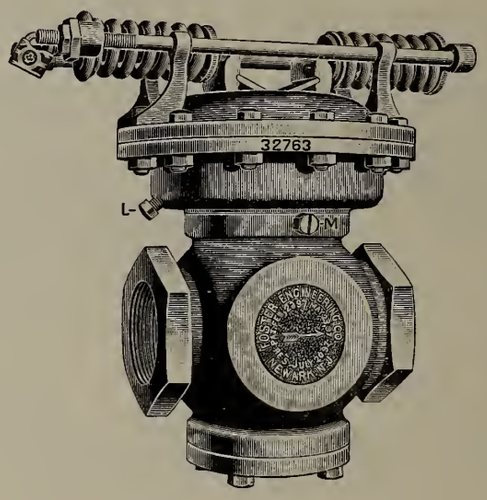

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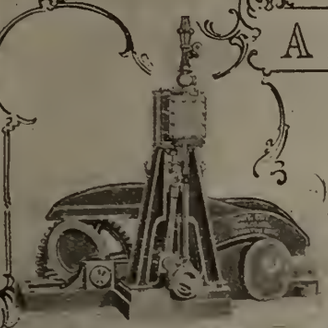
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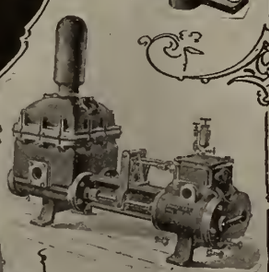
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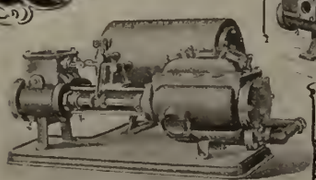
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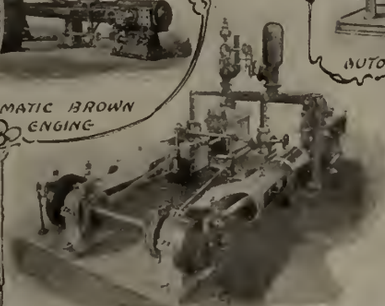
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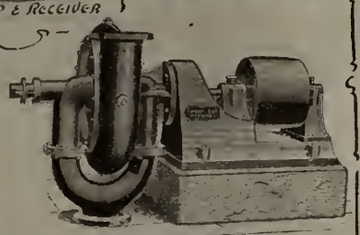
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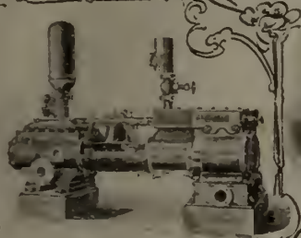
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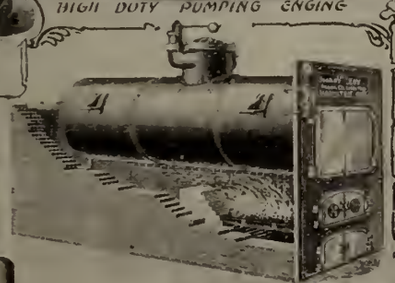
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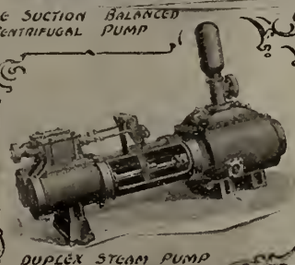
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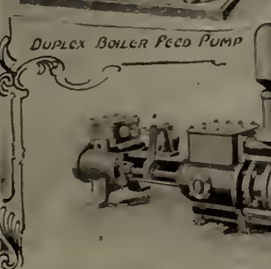
DUPLEX BOILER FEED PUMP

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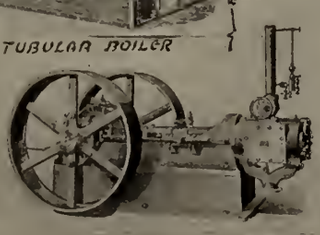
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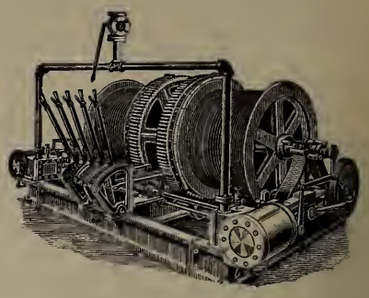

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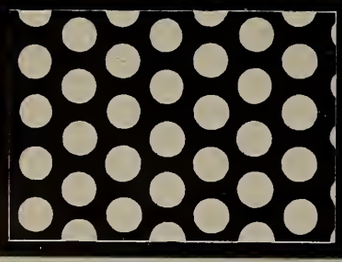

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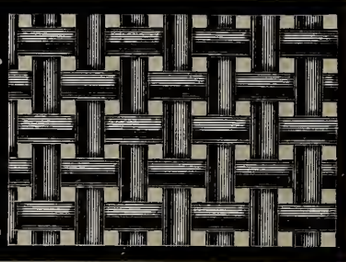

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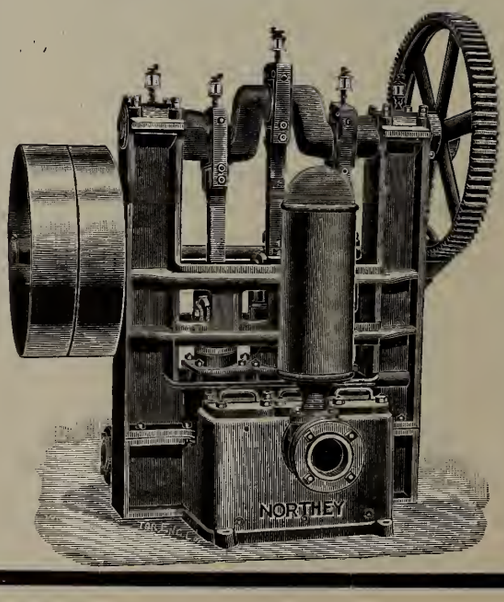

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Published Monthly.

OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XX., No. 12. DECEMBER, 1901. VOL. XX., No. 12.

Mining Experts.

An article with the above heading was recently printed by the *London Mining Journal*, which contains so much truth, and accords so well with our own sentiments that we reproduce it elsewhere in full. Besides the *Journal* several of our British exchanges, during the last month or two, have discussed what an expert really is, or should be, and the *Journal* has published some correspondence relating to the remarkable suggestion made by the president of the Institution of Mining and Metallurgy (Mr. C. Algernon Moreing) in his speech at the annual dinner of the Institution held on October the 17th. Mr. Moreing suggested that enrollment among the members of the Institution should be the "hall mark" by which the public could be sure that a man was a genuine qualified mining expert; to which the well known engineer, Mr. J. D. Kendall has objected, as an injustice to the many qualified men who decline to become members of the Institution. The correspondence (which has been carried through several numbers) is an illustration of the divergence of views which exists among engineers themselves, and is our excuse, if an excuse is needed, for bringing the matter prominently before the many mining engineers who form the constituency of the REVIEW.

One may search dictionaries and encyclopedias in vain for a proper and comprehensive definition of the phrases "Mining Expert" and "Mining Engineer." There is a distinction between them which is not generally appreciated by the public, and is not always kept in mind, even by engineers themselves, but which is, we venture to think, quite an important one. A mining *Expert*, to be worthy of the name, needs not only that knowledge of mine engineering in its details which the mining engineer has, but also that special and wider knowledge which embraces familiarity with ore deposits in many places and under diverse conditions, as well as knowledge of the *business* conditions attaching to the industry. To the school training of the engineer must be added that practical training in mining and metallurgy which is obtainable only by personal experience; so far there is common ground for both the engineer and the expert. In addition the expert must have a sufficient knowledge of, and experience in, practical geology to enable him to ascertain the structure immediately surrounding any given ore-body, and must also have that inborn, or acquired, business sense which enables him to balance the *certain* cost of production per unit (under existing conditions) against the *probable* income per unit, from the venture He must also be able to put these figures, together with the factors accruing from improved facilities, before his client in a clear, businesslike, and easily understood way. His technical views must be indisputable, while his economic views should be worthy of the greatest consideration, and subject to revision only by those men who are masters of finance in the marketing of the particular metals or ores under consideration. The *Engineer*, on the contrary, is primarily a man who, to the scholastic and practical experience above mentioned, adds an experience in those engineering matters and details which relate directly to the working of ore bodies; he has a mastery of the details and the principles relating to haulage, winding, winning of ores, handling of men, construction and maintenance of machinery connected with mines, and perhaps also the methods of transportation and reduction of ores. He need not have, necessarily, a knowledge of the economic conditions under which similar ores occur in other countries, or other districts, and he need not have special knowledge of the district, other than the geology of the deposit; nor need he know the costs and expenses of other departments than the mine department.

That these definitions set a high standard for the man who is fit to bear the title of "Mining Expert" we are aware, but that such a standard should obtain is most desirable, and will become patent to all our readers who will think the matter over carefully. In the articles to which we have alluded it is pointed out that, frequently a property which has been inspected and approved by a competent engineer is but too often a commercial failure because of the subsequent development and management of the property being left in incompetent hands. In such cases the failure of the enterprise is usually put upon the shoulders of the examining expert, instead of being laid at the door of the directors who imposed incompetent management upon the shareholders, or who disregarded the advice of the engineer, or who themselves were incompetent through inattention to business, through inexperience or through rascality. The discredit which has attached to mining ventures in Canada for several years past, and which is yet constantly attaching, is due in no small measure to the reason just mentioned. If the numerous investors in mining shares in Eastern Canada had chosen really competent and able engineers of sound repute to make examinations of the properties they contemplated investment in, and had paid him such a fee as would have placed him beyond the reach of temptation; and subsequently had followed implicitly his suggestions, taking care to elect for their directors men who were *competent* to direct, and willing to give some time to their board meetings that they might know what their engineer advised, instead of spending their time chiefly with the market value of their shares, mining would have been a favorite investment instead of being regarded as utterly unreliable and speculative.

The *Financial News* has said that "in fairness to mining experts it should be added that only in a limited sense is he responsible for the career of the company after its flotation." If an engineer who reports upon a property is not retained in a managing, or advising, capacity he can in no sense be responsible for the subsequent career of a company, but if he *is* retained in the above capacity, he is responsible to the extent to which the directors give him power and back him up. "If in spite of good direction and skilled management, the "business is a failure, then, indeed, the views of the expert may be "questioned and his opinions challenged, but until the success or "failure of a mine as a producer of saleable mineral has been demon-"strated, independently of all financial, commercial or administrative "interests, it is unjust to lay the whole burden of failure on the "shoulders of the mining expert."

The last five or six years of mining in Canada have shown clearly that the public as a rule do not care a rap whether a mining venture is sound or not; they have regard only to the paper certificates for shares, and look upon them as the chips or counters of a gambling game. They have not cared whether the quoted value of shares was fictitious or real (as recently in the now famous War Eagle), the one thing they have cared for is to know whether "big financial lights" were in the deal, if so then they "were in the game." The shares may run up or go down, and the engineers at the mine are praised or blamed accordingly; but this is not mining, though for a time it may masquerade under that name. The rocket-like rise and fall of "War Eagle," "Centre Star," "Republic," "Montreal and London," "Knob Hill," "Payne" and other countless shares was no feature of *mining* but a characteristic feature of the *share market*, as the REVIEW has time and again pointed out in the last few years.

In considering our last paragraph we are brought to look closely at the men who have been *directors* of mining companies, occupying positions which in law are considered responsible, but who have hastened to disclaim their responsibilities, and put it on the shoulders of their managers. "We know nothing of mining!" has been a favorite phrase in Toronto and Montreal. It is not important whether directors know anything of the technicalities of mining or not, but it is important that they should attend to their proper business of directing the financial and administrative departments of their company, and they should be responsible for the selection of the management they choose to impose upon the shareholders.

The REVIEW wishes to go on record as stating plainly that, if an incapable manager is sent to a mine *it is not his fault that he is put in that position*, but it is entirely the fault of the directors who have put him there; in this view of the case how many of the mining failures in Canada during the last six years are chargeable to the managers? We state unquestionably that the greater number should be laid directly at the doors of the board of directors. When a board selects a raw student with a certificate from a school of mines, or a book-keeper from a commercial house, or a voluble wind-bag from a strange town, whose sleekness of address and sanctimoniousness of appearance enables him to pick dollars from peoples' pockets in exchange for scraps of printed paper, that board, and not its appointees, are responsible to the shareholders and to the public whom they invite to purchase their shares. In other words, suppose real mining experts, as a class, are willing and anxious to do their duties to the community, is the community willing to, and does it, do its duty to them? In Canada during the last six years the answer unquestionably is "No."

An expert must keep in mind his own good reputation and the interests of his employer, and he also must have regard to the interests of the public to whom his employer may impart his opinion for the purpose of obtaining public support. That legislation, or enrollment in the membership of any technical institution, will, or can, enable the public to select *only* competent men to advise them, is in the highest degree improbable. No law, anywhere in the world that we know of, prevents any individual calling himself a mining expert, and membership in an organized body, society, or institution, as a rule, does not mean that its members are guaranteed to the public as qualified and honest; but simply means that one pays so much per year for the privilege of membership.

While the REVIEW agrees in the main with the desirability of putting, as Mr. Moreing says, a "Hall Mark" upon engineers, that the public may in a measure know who is qualified and who is the genuine article, yet we are equally in agreement with Mr. Kendall that membership in any institution would be an unjust criterion for a large number of fully competent engineers who may not choose to become members of that institution. The REVIEW has gone over this ground before, at the time when the Canadian Society of Civil Engineers sought to impose membership in that society as a qualification for any engineer electing to practice in Canada; the arguments we then used hold good now against Mr. Moreing's suggestion of membership in the Institution of Mining and Metallurgy. Were it possible to safeguard the practice of mining engineering as the practice of medicine is safeguarded, and without a concurrent obligation of membership in a society, the REVIEW believes the mining profession would thereby be placed upon a better basis, but at the present time this is impossible, and the man who is able, capable and honest needs no further vouching than his record, and his clients, give him.

No man who lacks a thorough training both practical and technical as an engineer and metallurgist, and who has not added to his training a wide experience in the management of mines or metallurgical works should presume to offer his services as an expert. It is not the best miner, nor the best metallurgist, nor the best manager, who can necessarily best perform the varied duties of an expert; such a one is he who combines with a broad experience a sound and well trained financial judgment. In the last analysis of this question the responsibility for a good engineer lies with the investor, for so long as men are willing to employ men of uncertain reputation, to accept opinions instead of actual, determined details and facts, so long as men do not demand as full a statement of facts about *mining* ventures as they demand about *manufacturing* or *mercantile* ventures; and so long as they prefer cheap men and decline to pay reasonable fees, just so long will the bogus mining expert be available for them, and help them with fake enterprises. The general public needs educating that it may put the blame of failure upon the promoter, the director, or the proper person instead of putting it solely upon the mining engineering profession. It further needs to understand what the functions and responsibilities of a mining expert or engineer are, and to realize that success in mining depends not upon luck, nor *solely* upon the engineer, but also upon the sound judgment and honest co-operation of the men chosen for the directorate of the enterprise.

The article from the *Mining Journal* is as follows:

"Some of our contemporaries have recently taken up the subject of reports by mining experts, and are comparing the present value of the shares in various mining companies with the price at which they were issued. This is a subject which falls peculiarly within the province of this journal, and it is one to which we have from time to time called the attention of our readers. As far back as 1894 we published a series of leading articles not only upon the duties of mining experts, but also upon those of every official of a mining company, from the chairman downwards, while every year we publish a return of the principal companies registered in the preceding twelve months, and of the engineer

FOR KING AND EMPIRE.

LIEUTENANT J. EDWARDS LECKIE, D.S.O., M.E.

Late of Strathcona's Horse, who goes out to South Africa again with Canada's Third Contingent in defence of the Empire.

upon whose reports the enterprise was commenced. Our contemporary, the *Financial News*, in a preface to its recent articles on the "Mining Expert," very justly remarks that "in fairness to the mining expert it should be added that he is only in a limited sense responsible for the career of the company after its flotation," and in this we heartily agree. Over and over again we have called attention to various mining adventures which have proved unsuccessful, not because the mines were intrinsically valueless, but because the management was left in totally unskilled hands, the direction being entrusted to a board not only ignorant of local conditions, but without even administrative experience. For failures of this class the expert is certainly not responsible. There is, moreover, another class of failure with which he has nothing to do—viz., that which results from manipulation of the shares, causing an inflation above their intrinsic value, and a subsequent but certain depression below it. We are here face to face with a grave danger to mining operations, and one which is constantly bringing them into discredit. The industry which, with the exception of agriculture, is the only one which deals with the production of the raw material upon which the wealth, not only of individuals but of nations depends, has surely enough inherent risks to deal with without the addition of others of a purely speculative and financial nature. There are geological risks, for lodes and mineral deposits are extremely erratic in their occurrence, and call for all the skill and knowledge of the expert; water risks, caused by either too much or too little of that essential element; risks of fire, transport, labour and supplies, and others too numerous to mention, all of which the skilled manager is prepared to encounter, and has been trained to face. But he is not capable, nor should he be expected to struggle with the financial problems caused by operations in Throgmorton Street. From these both he and the expert upon whose report the company was floated should be judged free. Unfortunately, however, the average shareholder displays an almost criminal carelessness as to the disposition of his money. As a rule he speculates for a rise. If this does not come off, then, regardless of the intrinsic value of the property, he is strongly tempted to say unpleasant things with regard to the expert. There is still another point of view which should not be lost sight of. For every property which a skilled and competent expert sees his way to recommend, there are at least a dozen others which he has unhesitatingly condemned. For thus saving the useless expenditure of capital he obtains no credit whatever; indeed it sometimes happens that the disappointed vendors are in a position to do him great damage for having conscientiously performed his duty. It would, therefore, only be fair, although legal consequences might render it impracticable, when preparing a list of the properties with which an expert has allowed his name to be associated, to prepare another of those with which he has not deemed it advisable to be connected, or as regards which he has not advised the expenditure of capital. The position of a mining expert is not a pleasant one. It is one of very great responsibility. If he, in the exercise of professional skill, condemns a property, which is by far his most common experience, he obtains no credit, but is sometimes made to suffer for his truthfulness. If on the other hand, he approves of a property, and the subsequent development be left in incompetent hands, he is again blamed and his reputation ruined if once his name become unfavourably known to the investing public. It is difficult to point out a remedy. Care should be taken to choose a really competent man and to pay him a good fee, which will place him beyond the reach of temptation. We can record an unhesitating conviction that, as a rule, an expert's report is really his honest opinion based upon his knowledge and experience. When his report is received his suggestions should be followed implicitly; should he himself be unable to superintend the subsequent operations great care must be exercised in appointing a competent manager, and also in electing a board which in fact as well as in name is a board of directors. Let them direct and let the manager manage. If in spite of good direction and skilled management the business is a failure, then, indeed, the views of the expert may be questioned and his opinions challenged, but until the success or failure of a mine as a producer of saleable mineral has been demonstrated, independently of all financial, commercial or administrative interests, it is unjust to lay the whole burden of failure on the shoulders of the "mining expert."

The Annual Report of the Centre Star Company.

The REVIEW has received the Third Annual Report of the Directors of the Centre Star Mining Company, Limited, submitted to its shareholders on November 26th. This year the shareholders have not been favored with the opinions of the directorate, which occupied two or three pages of the text of the second annual report, nor have Mr. Wayne Darlington's opinions and boom telegrams been introduced; in fact the distinguished consulting engineer's opinions are conspicious by their absence.

The report shows that the cost of production has been somewhat, and the cost of development very much, reduced which is greatly to the credit of Manager Kirby. At the same time the text of the General Manager's report does not give shareholders any substantial reason to believe that the value of the property has increased in any degree. In fact, from an examination of the report, it is evident that development work during the last twelve months has failed to reveal any considerable body of payable ore, and it confirms the opinion which the REVIEW expressed last year that the Centre Star Mine is a property of very small present real value.

Development work during the year has opened up the fifth level, which failed to show any ore (on the level) higher than $9.37 *smelters' gross assay* value or $3.37 net value, from which sum the costs of production and maintenance must be met. In a raise from this level we are told there are some fifty feet in length of pay ore assaying $14.25 smelters' gross value which is about the average of last year. This small body is found in the first fifty feet below the fourth level but it does not run down to the fifth. The work on the sixth level (some 200 to 300 feet) has shown no values as yet, and the seventh level was not started at the time of the annual report. There is, therefore, a very small tonnage of payable ore in sight, which the manager estimates at 44,000 tons of about the same average value as the ore which has been sold during the past year.

For the year ending September 30th there were mined 72,645 tons, at an average cost for mining and development of $3 53 per ton; nearly 8,000 tons were sold from the dumps, storage, etc, which cost 29 cents per ton for handling, making the total ore shipments for the year 80,419 tons, and reducing thereby the mining cost per ton from $3.53 to $3,21 The gross assay value of the ore shipped was $14 64, the cost of freight and treatment was $6.00, the cost of production (mine costs included) was $3.90, the charge per ton necessary to redeem existing indebtedness, was $2.26, leaving $2.48 per ton as the margin for profit for the 80,419 tons sold:—

Smelters gross assay value, 80,419 tons.....		$14.64 per ton.
Cost of freight and treatment per ton...	$6.00	
Cost of production (mine cost $3.53) per ton.....	3.90	
Cost of redemption of debt per ton.....	2.26	12.16 per ton.
Margin per ton.....		$2.48

Those who saw our analysis of the second annual report may remember that the REVIEW figured the actual future costs of extraction, shipping and smelting at about $9.22; the amounts given in this report show that that cost has been pretty closely approximated, as

the actual figures from the report before us show $9.90. This reduction is very creditable to Manager Kirby, but we regret to say it does not impress the REVIEW any more favorably with the value of the Centre Star stock as an investment. The company had a little over nine months active work during the fiscal year, when its operations were brought to a close by the Rossland strike in the month of July, and production from the entire camp was stopped.

With the small amount of reserves showing, we can not see that there is any special inducement for the LeRoi company to consolidate with the Centre Star and War Eagle. Doubtless an economy for the two latter companies would be effected in the charges for smelting, but the benefits to the shareholders of the LeRoi company are not apparent.

The market quotations for the stock averaged $1.50 per share twelve months ago, to-day the quotations average 32 cents per share, which figure, in view of the report before us, is certainly high enough.

The Slump in Copper.

In the October issue of the REVIEW we referred at some length to the decline in the price of copper and the situation very largely brought about by the manipulations of the Amalgamated Copper Company. In view of the continued fall in prices, it will not be out of place to refer again to this subject. The aim of the Amalgamated Copper people was to acquire so commanding a position by means of the acquisition of producing interests, not only in the United States, but elsewhere, as to enable it to control the markets of the world and dictate prices to the trade. M. Secretan had a like fantastic inspiration, though he set out to accomplish his purpose in a different manner, his scheme being to buy up secretly all available supplies, and thus place the market at his mercy. To this end he employed as his chief instrument the Secieté des Métaux, and enlisted the support of a great Paris banking institution. He persuaded many of his wealthy acquaintances to join him in buying copper and storing it away, giving them in many cases his personal guarantee against loss in the event of the price falling. In this way he came, directly or indirectly, into possession of the best part of a hundred and eighty thousand tons of the metal, and drove up the price to $835 00 per ton, in contrast with $175.00 in 1884. When, in the following year, the inevitable collapse came, he and his group were found to hold about a hundred and sixty thousand tons. The rest of the story—the tremendous break in the price, which went down to $175.00 per ton, the downfall of the bank which lent its resources in support of this insane gamble, and the bankruptcy of numerous private individuals, is stilly pretty fresh in the memory of the Paris and London metal exchanges. Our friends across the line, however, work on an altogether different and vaster scale. The Amalgamated Company was not satisfied with merely purchasing the metal from producers; it aspired to get control of the production itself by consolidating the mines in a great trust. Beginning with a capital of seventy-five million dollars, in shares of a hundred dollars each, which were issued in May, 1899, at par, in June of the current year the proprietary passed a resolution for increasing it to a hundred and fifty-five millions in order to acquire the Boston and Montana and the Butte and Montana undertakings at the price of five and a third Amalgamated shares for each one of the former company's shares, and the same number of shares of the Amalgamated for one and a third of the Butte and Montana Company. The value of the properties to be acquired for eighty million dollars was estimated by one leading firm of experts, engaged for the purpose, at seventy-five million dollars and by another at eighty-five million dollars. A discrepency of ten million dollars was, however, a mere bagatelle, especially as, in anticipation of the "deal," the shares of the two companies whose interests were to be acquired were raised to a point putting on them a market valuation of ninety million dollars, whereby it was made to appear that the Amalgamated people were "getting in" cheaply. But the measure of the latter's ambition was not yet by any means full. Other important producing interests were approached. Is was greatly desired to capture the Calumet and Hecla, which had an annual production of upwards of ninety thousand tons, or about one-fourth of the entire output of the whole of the Butte district. But it failed in its efforts in this direction. At the time of the foregoing increase in the capital various interests outside the combine, representing an annual output of about forty million pounds of copper per annum, got together and under the lead of the Heinzes, who controlled the Montana Ore Purchasing Company, incorporated themselves as the United Copper Company with a capital of eighty million dollars, the object being to fight the Amalgamated Company.

The latter was stated, as far back as July last, to have been compelled to accumulate a stock of as much as a hundred and thirty-five million pounds of copper, after deducting all future sales, in order to enable it to support the market. This represented about 22 per cent. of the total output of all the mines in the United States, and it is believed that at a quite recent date it had increased its holding to upwards of a hundred and eighty million pounds, the addition beng at the average rate of more than twenty million pounds per month. If this process were continued to the end of the year the company would have on its hands a very formidable proportion of the whole output for the twelve months. It is, however, said that the company has been secretly selling considerable amounts. The statement that it had disposed of a large quantity at 14 cents per lb. emanated from what is regarded as a tainted source; yet it would appear that confirmatory evidence has been forthcoming. If the fact of these sales were established beyond all possibility of doubt, it would cause no surprise in the trade, which has for many weeks past been plied with stories from several different and independent quarters that the company had wearied of its efforts to sustain the market, that it had accumulated a much larger stock of the metal than was found convenient, and that it recognized that the more it piled up the more it would have to accumulate. Another and widely credited story attributed to it an intention to "break" its price—17 cents per lb.—for electrolitic copper in order to bring about a collapse in the market quotation of the shares of those American and European producing companies which refused to throw in their lot with it. By this means, it was suggested, the combine would be able to purchase those shares on so extensive a scale as to give it a controlling interest. Several weeks ago it was publicly stated that overtures were understood to have been made to the Rio Tinto Company in order to induce it to come to some arrangement for restricting its output, and that the directors of the latter turned a deaf ear to the scheme. The Rio Tinto Board is composed of gentlemen whose policy is eminently conservative, and probably nobody in the world except the engineers of American trusts would have run the risk of encountering the rebuff that was certain to await them. It is possible that the Amalgamated Copper people are still hoping against hope that by bringing pressure to bear they may still succeed in inducing that important company to enter their fold, and that this object is being sought through the medium of a raid on the shares, aided by a collapse in the price of copper. It is also not unlikely that the breakdown in the latter has merely been effected for the purpose of enabling the people who run the combine to load themselves up with cheap shares, and that when they have acquired as many as they want they will once more proceed to lift the price of the metal and "corner" the "bears," of whom there must be many in existence; or, again, it may be that their one purpose is to compel outside producers in the United States to reduce their output. But all this and a good deal else in the

same connection is the merest speculation. Nobody not in the secrets of the inner ring can know to a certainty what is going on, the only known fact being that the copper market has been thrown into a state of utter demoralisation by these American manipulations.

If affairs in the immediate future depended upon legitimate supply and demand the problem would not be a particularly difficult one to solve. Unfortunately it contains too many unknown factors. Even as regards so seemingly simple a question as that of consumption the best recognized authorities are unable to agree among themselves. On the one hand we are assured that, so far as Europe is concerned, it is increasing, and, on the other, that it is diminishing. To decide between the two is impossible. Yet from all the known facts bearing upon the industrial situation, the weight of evidence would appear to be greatly on the side of those who maintain that consumption is falling off. One has only to consider for a moment the immense check that has been applied to enterprise, especially in the electrical industry, in Germany, France, and Belgium, to be driven to the conclusion that less copper is being used now than either in 1899 or last year; yet we are told that deliveries are once more overtaking supplies, and stocks diminishing. The same has been said in regard to the position in the United States. Last year's output was about 268,000 tons out of a total production for the whole world of 486,000 tons. Ten years ago the world's production was only equal to that of the United States alone at the present time. It has been estimated that for the ten months to the end of October last the United States produced a little over 223,000 tons, or about the same amount as in the corresponding period of 1900. In the same interval it imported 50,000 tons, and started the year with a stock of 40,000 tons, making the aggregate supplies 314,000 tons. From this has to be deducted 68,000 tons exported, and an estimated home consumption of 138,000 tons, the nett result being that at the close of October there seemed to be a stock amounting to 108,000 tons. The several foregoing estimates are susceptible of considerable variations. Authorities disagree; but a fair average among the majority of them brings out the fact that the actual stock can hardly be less than 90,000 tons, the bulk of which is, or rather was, in the hands of the Amalgamated Copper Company a month ago, which, at the then price of the metal, represented a value of probably over five millions sterling. To carry that bulk of copper is no serious task for so powerfully backed an interest. But the question is not one that concerns its financial strength. Europe is finding much of its supplies in other quarters than the United States, and while production keeps up and consumption is on the wane the combine, in order to keep up prices, would have to meet this position by reducing its own production, or going on buying, or both, the only alternative being to throw up the sponge and permit prices to sink to a normal trade level. Most business men will no doubt be of opinion that the game of artificially keeping up the market must be about played out.

A Bounty Wanted for Arsenic Refining.

Readers of the REVIEW are aware that the problem of extracting the arsenic from the auriferous mispickel ores of Hastings County, Ont., has been successfully solved by the Canadian Gold Fields, Limited, an English company operating at Deloro. During 1900 this company produced 606,000 lbs. of arsenic of an estimated value of $22,725 and for the first nine months of this year 975,054 lbs. of a value of $30,432. The plant and process employed by this company were fully described in these columns in our issue of March last. With a view to promoting the further development of this important young industry, the mine owners and residents of Hastings County have petitioned the Dominion and Ontario Governments for a bounty, the claims for which are fully set out in the following letter addressed to the Hon. the Minister of Finance by the Secretary of the Committee:—

"On behalf of the residents of this district who are asking to have Arsenic placed on the bounty list, and in compliance with your request, I herewith submit to your notice a few facts concerning the production of refined Arsenic in Canada, the market there is for it on this continent, and the condition of the Arsenic trade in England and in Europe.

The published information on Arsenic throughout the world is meagre. In the Library of Parliament at Ottawa there are only two items, one relating to a new lode of arsenical pyrites at Bastia, France, and one from Liege, Belgium, so what data I have been able to get together, is from information from other sources.

The principal source of the world's supply of white Arsenic has been Devon and Cornwall, and while the industry in England is declining (see London *Engineering* copied in Kingston *Whig* September 11th and Montreal *Star* August 31st) the old land yet holds the control of the Arsenic trade.

The Arsenic produced in England is obtained as a bi-product from the tin and copper ores and from what is locally called mundic ore; as long as England's mines produce tin and copper they will also produce Arsenic; but mining in Cornwall now is made very costly by reason of the great depths and size of the workings, and the enormous volume of water that must be pumped, hence it becomes very difficult for mines so situated to compete successfully with less expensive locations. To this fact is largely due the possibility of Canada becoming an Arsenic producer.

Europe produces Arsenic in large quantities, but the exact output for any one year I have not been able to ascertain. In the report from Liege before referred to, it will be seen that the exports to U. S. for latter half of that year (1898) were $29,225. Germany produces and exports Arsenic. Portugal produces and exports Arsenic; one firm there has now in stock 1,500 tons, holding it for a higher price, and I understand that but a small percentage of their total area of arsenical deposits are as yet developed. Spain also contains ore from which has been extracted Arsenic and Silver; steps are now being taken to re-open an important mine of silver and Arsenic in Spain. I presume the conditions that warrant us here in seeking to establish the Arsenic industry in Canada, warrants the man in Spain in seeking the same object. Italy and Hungary also produce Arsenic.

From 1890 to 1901 Arsenic has varied in price from £12 to £23 per ton of 2,240 lbs. At present the price is low being quoted in New York at 3 cents per lb. and by reason of heavy stocks being held (one firm in Cornwall is holding 3,000 tons) the price is likely to remain low for several months, perhaps a year.

I may say that my informant tells me that both the stock of 3,000 tons in Cornwall and the 1,500 tons in Portugal are being held for a higher price than that now prevailing, and it is very possible that both these firms require a higher price in order to make a profit. It would be folly for us to seek to establish Arsenic production in Canada unless conditions were such that we could, when developed and when works of sufficient capacity were in operation, produce Arsenic of the very highest quality at a less cost per ton than anywhere else in the world, and I hope to show you that these necessary conditions do prevail in Canada.

What is now desired is that the Arsenic required in both the United States and Canada be supplied by Canada. We are in a better position to supply this trade than England or Europe can be, and it is the American trade we now figure on.

Under date of June 17, 1901 I am advised by Department of State, Washington, D.C. that in 1900 there were imported into U. S. 7,047,353 lbs. Arsenic, value $333,153. For year 1899, 10,539,439 lbs., value $415,066. In 1899 there were imported into the U. S. and Canada 5,567 tons of Arsenic. Canada during four years ending 1898 imported 2,224,783 lbs. valued at $82,103. Since 1899 the Canadian imports would not show Canada's consumption, for some users have bought Arsenic direct from Canadian Goldfields, Limited, Deloro, Ontario.

Arsenic is duty free everywhere.

The present capacity of the only Arsenic works in America is

1,000 tons per annum located at Deloro, Hastings County, Ontario, 160 to 180 men employed; monthly pay roll $7,000, besides outlay for wood, timber, etc.

The reason why we consider the U. S. market as tributary to Canada is that up to date no Arsenic has been produced commercially in the U. S. (See letter in *The Engineering and Mining Journal*, N.Y. July 6, 1901).

A deposit of mispickel and of realgar, both capable of producing Arsenic have lately been discovered in the State of Washington, but if Canada produces Arsenic in quantity they are not likely to embark in the business in Washington for the good reason that the conditions prevailing are very different to those in Hastings, nor is their mispickel equal to ours as an Arsenic producer—theirs contains both zinc blend and lead, either of which are difficulties in Arsenic production.

To increase the output of Arsenic in Canada from 1,000 tons to 5,000 tons per annum means the erection of four such plants as that now in operation at Deloro, and an outlay of fully $600,000 in plant alone, and at least an equal amount would be required in order to pay for mispickel properties on which to work. It may be said that the actual *cash* investment to be made in Canada in order to produce 5,000 tons of Arsenic yearly would be fully $1,500,000.

It would be very foolish on our part for us to seek to interest capital to this extent if we were not confident that we have the ore bodies on which such an amount could be invested with safety, but we have the ore, the labor, the water-powers, the fuel for many years, the railroads, the climate, the supplies of all kinds at lowest cost,—all we want is capital directed by skilled men in order to make this district prosperous.

A pay-roll of $400,000 per annum will be the result of this effort if successful.

To produce a ton of refined Arsenic means the consumption of one ton of coke for refining purposes alone.

To produce 5,000 tons of Arsenic per annum in this district means 12,000 tons of freight per annum, most of it long haul, and much, high class.

The quality of Hastings' Arsenic is very high (See Prof. DeKalb's report *Canadian Mining Review* July 31, 1901).

The manufacture of casks in which to pack the Arsenic would, with an output of 5,000 tons per annum, be of itself an important industry, and would provide a paying market for elm timber now of little use. This district contains large quantities of this wood.

The desire to make Canada something more than "a hewer of wood and drawer of water" for other countries, can be assisted by Arsenic production.

The refined Arsenic produced in Canada and placed upon the market by the Deloro Company is the purest, and is now recognized by the trade as such. This was not always known to be the case, a very strong prejudice had to be overcome, and Deloro Arsenic was for a time sold in New York as English; now it is sold for what it really is, viz. Canadian Arsenic.

The consumption of Arsenic in America needs to be cultivated and it is the intention of men who are giving this business serious consideration to do so if they take it up, both in the line of agricultural chemistry and for manufacturers. This experimental work will cost a lot of money but will result in larger trade for our country if successful, and if not, will have cost the public nothing.

The fact that Arsenic is being, and can be produced in Canada, at less cost per ton than it can be anywhere else, is no miracle; it is made possible by reason of the gold contents in the ore from which the Arsenic is eliminated. This gold value is won and goes towards paying the costs of mining and treating, but unless the Arsenic is won also, the gold contents of the Hastings mispickel would not alone pay; our mispickel mines are Arsenic mines, not gold mines. The treatment of Hastings mispickel is an industrial, as well as a mining proposition in the true meaning of that term.

The gold contents of our mispickel, combined with our first class labor in plenty, our water-powers, and all other facilities required for the economical working of onr large bodies of low grade ores, makes a fact of the assertion that Canada will be able to produce a ton of Arsenic, at a lower cost than it could be produced elsewhere if the required capital can be interested.

The same regarding pig iron could with truth have been said of Sydney, but saying it truthfully is not doing it. The capital and bounty combined with natural facilities made it possible for Sydney to produce a ton of pig iron cheaper than it can be done for anywhere else, and bounty combined with natural facilities and capital may be expected to have a like result on Arsenic in Hastings. It will be noted that the only arsenical ores referred to as gold bearing are our Hastings mispickel; Canada is unique in this respect, and it constitutes an element of strength for this business here.

You will also note the large number of men employed in works producing three tons refined Arsenic per day.

A bounty on Arsenical ore is asked for from the Dominion Government and the Ontario Government to run for a term of years and gradually decrease until the bounty is extinguished, time being given in which to erect works before bounty term commences."

I remain, dear Sir,
Your obedient servant,
JOSEPH JAMES,
Hon. Secretary of Committee.

A Record Year in Canadian Asbestos.

A year ago we pointed out that 1901 would be the banner year in the history of asbestos mining in Canada, and the unparalleled activity which has prevailed at the mines, the acquisition of new producers, the erection of costly milling plants, together with a greatly increased output and a considerable advance in prices have more than justified our prediction.

Complete figures for the year are of course not yet available, but by going carefully over the monthly statements of the Department of Customs we have been able to compile an interesting return of the exports from the first of the year to the end of October. These figures, which, by the way, we may say, are likely to be under, rather than over, estimated, show that the exports for the present year will be over the million dollar mark. This Quebec industry has always been highly profitable, but never more so than in 1901.

1901.	No. I Grade.		No. II Grade		No. III Grade.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
January	40	$4,000	84	$4,700	1,197	$23,085
February	26	2,605	280	12,600	915	17,956
March.....	352	13,250	104	5,450	1,044	24,962
April.....	86	8,625	186	10,580	1,251	31,465
May	1,895	43,084	141	8,683	1,683	41,796
June	616	54,069	414	18,989	1,846	44,280
July.....	361	46,875	204	11,329	1,380	35,808
August.....	431	56,185	351	11,850	2,377	53,585
September.....	418	52,605	171	9,080	2,217	46,473
October	203	21,728	118	5,765	4,198	108,987
Total....	4,428	303,026	2,053	99,026	18,108	428,397

The following returns, compiled from the same source, shows the monthly distribution of these exports:—

1901.	No. I		No. II		No. III		All Grades	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
January—		$		$		$		$
To Great Britain ..	20	2000	57	3200	364	6975		
" United States..	20	2000	27	1500	780	15585		
" Germany.....	....	.....	....	.....	.....	.....		
" Other countries	....	.....	....	.....	53	525		
Total.....	40	4000	84	4700	1197	23085	1321	31785
Carried forward..	....	.....	....	.....	.....	.....	1321	31785

MONTHLY DISTRIBUTION OF ASBESTOS SALES—*Continued.*

1901.	No. I		No. II		No. III		All Grades	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
		$		$		$		$
Brought forward	....	.....	....	.....	.....	.....	1321	31785
February—								
To Great Britain	....	.....	....	.....	249	4980		
" United States	26	2600	280	12600	629	12436		
" Germany	....	.....	....	.....	17	340		
" Other countries	....	5	....	.....	20	200		
Total	26	2605	280	12600	915	17956	1221	33161
March—								
To Great Britain	....	.....	30	1750	205	4925		
" United States	352	13245	62	3100	712	18147		
" Germany	....	.....	12	600	62	11240		
" Other countries	....	5	....	.....	65	650		
Total	352	13250	104	8450	1044	24962	1500	43662
April—								
To Great Britain	....	.....	57	3130	30	450		
" United States	86	8625	110	6290	989	26421		
" Germany	....	.....	18	1080	.....	.....		
" Other countries	....	.....	1	80	232	4594		
Total	86	8625	186	10580	1251	31465	1523	50670
May—								
To Great Britain	80	4800	....	.....	135	3925		
" United States	1700	12084	141	8683	1548	37871		
" Germany	...	.....	....	.....	.....	.....		
" Other countries	165	26200	....	.....	.....	.....		
Total	1895	43084	141	8683	1683	41796	3719	93563
June—								
To Great Britain	15	2400	65	4275	270	4754		
" United States	230	22405	87	5835	1449	36418		
" Germany	15	2520	145	4109	75	1498		
" Other countries	356	26744	117	4770	52	1610		
Total	616	54069	414	18989	1846	44280	2876	117338
July—								
To Great Britain	91	13825	50	2500	46	1054		
" United States	65	8550	2	144	943	23649		
" Germany	50	8100	102	7686	391	11105		
" Other countries	155	16400	50	999	.....	.....		
Total	361	46875	204	11329	1380	35808	1945	94012
August—								
To Great Britain	85	13671	5	625	115	1825		
" United States	135	23884	196	8225	2182	50898		
" Germany	86	7280	150	3000	80	862		
" Other countries	125	11350	....	.....	.....	.....		
Total	431	56185	351	11850	2377	53585	3159	121620
September –								
To Great Britain	95	13900	131	6580	651	12564		
" United States	95	13360	....	.....	1516	32408		
" Germany	73	11745	20	1000	50	1501		
" Other countries	155	13600	20	1500	.....	.....		
Total	418	52605	171	9080	2217	46473	2806	108158
October—								
To Great Britain	23	3330	90	4125	142	3275		
" United States	155	15998	20	1000	3284	87131		
" Germany	25	2400	....	....	552	15366		
" Other countries	....	.....	8	640	212	3215		
Total	203	21728	118	5765	4190	108987	4511	136480
Total exports of Canadian Asbestos, to 31st October	.....	.....	.....	.....	.....	.....	.....	830449

Anglo-Canadian Gold Estates.—It has been decided to postpone the installation of a stamp-mill at the Elizabeth mine, Lake of the Woods, for six months, during which time underground work will be pushed on so that there may be an unfailing supply of ore to draw upon when the crushing machinery is in. The site is practically ready for the mill, so that, at any time that it is thought advisable, the machinery can be put in.

Electric Drills at the Payne.—Mr. A. C. Garde, manager of the Payne mine, Slocan District, B.C., reports the installation of three electric drills which are giving entire satisfaction.

OUR ILLUSTRATIONS.

Lieutenant Jack Leckie, D.S.O., M.E.

As everybody knows, Canada is again giving tangible evidence of its very pronounced fealty to the British flag by the despatch of another contingent of mounted troops to aid the Mother Country and our glorious Empire in rounding up the guerilla Boer. To this last, as it did to all the other contingents we sent out, infantry, artillery and mounted troops, the mining profession yields its quota of officers and men.

Major Hamilton Merritt of Toronto, who goes out to South Africa as second in command of this very fine body of men, has been in practice as a mining engineer for many years, having served on the Royal Commission appointed by the Ontario Government to make a report upon the mineral wealth of Ontario, and, for a year or two after its inauguration, as lecturer in mining engineering at the Kingston School of Mines. Major Merritt went out to South Africa shortly after the war broke out, doing good service in the field as an officer of Brabant's Horse.

A Commission has been given to another old friend, Captain Bruce Carruthers, one of the Governors of the Kingston School of Mining. When the call to arms came, Carruthers, who is a gentleman of means and who had held a Commission in a British cavalry regiment, applied unsuccessfully for a Commission in the first Canadian contingent. He was, however, determined upon seeing service and, rather than be left behind, he went out to South Africa as a private and returned with the regiment a non-commissioned officer.

The officer, however, who is most widely known to the mining profession in Canada is Jack Leckie, the youngest son of that veteran in Canadian mining enterprise, Major Robert G. Leckie. Lieutenant J. Edwards Leckie, after graduating at our Royal Military College, spent several years down in Nova Scotia in charge of the Torbrook iron mines, after which he went out to British Columbia and established a consulting practice with the firm of Leckie & Harris at Greenwood When Lord Strathcona raised his splendid regiment of mounted infantry, Jack Leckie was given a commission as lieutenant, and for conspicuous gallantry in the field was awarded the D. S. O. He had also the distinguished honor of receiving from the hands of the King the colors presented to the regiment on its return from active service.

The REVIEW, we are sure, voices the sentiments of every one of its readers when it heartily wishes these gallant fellows, Merritt, Leckie, and Bruce Carruthers, a pleasant voyage, the best of good luck, and a safe return to the land of the maple.

Our Iron Industries in Ontario.

One of the outstanding features of the year just closed has been the steady development of our iron mining and smelting industries in Ontario, Quebec and Nova Scotia. The following returns of the exports of iron ore and pig iron for the ten months ended October last speak for themselves of the progress being made in these industries :—

1901.	Iron Ore.		Pig Iron.	
	Tons.	Value.	Tons.	Value.
January	551	$1,096	146	$3,708
February	348	1,829	111	3,076
March	628	14,906	82	1,716
April	342	546	975	18,800
May	4,294	10.759	169	4,113
June	48,703	121,913	1,471	22,084
July	26,338	65 627	2,775	48,050
August	56,315	142,084	5,119	59,884
September	61,844	152,179	3,301	43,604
October	6,038	14,608	15,175	131,395
Total	205,401	$525,547	29,324	$336,430

IRON MINING IN ONTARIO.

, Helen Iron Mine, Second Bench ; August 1900.

Helen Iron Mine : Plant for Crushing Ore.

IRON MINING IN ONTARIO.

Temporary Ore Dock of Lake Superior Power Company, Michipicoton Harbor.

Helen Iron Mine: General View, August 1900.

IRON MINING IN ONTARIO.

Charcoal Iron Plant of the Deseronto Iron Co. at Deseronto, Ontario.

Unloading Iron Ore at Pier of the Deseronto Iron Co.

IRON MINING IN ONTARIO.

Blast Furnace Steel Works of the Hamilton Steel & Iron Co., at Hamilton, Ont.

Rolling Mills and Forge of the Hamilton Steel & Iron Co., Hamilton, Ont.

INTERIOR OF FURNACE PLANT, HAMILTON STEEL & IRON CO.

1.—Interior of Cast House and Front of Furnace. 2.—Showing Gas Connections to bottom of Stoves and Hot Blast Main. 3.—Base of Draft Stack with Sixty inch Waste Gas Mains from Boilers. 4.—Cast Hoist, Furnace, Stoves, Hoist Tower, Hoist Engine House, and portion of Stack House. 5.—Rear end of Stack House and Stoves; shows Cold Blast connections on top of Stoves.

IRON MINING IN ONTARIO.

Furnace Plant of the Canada Iron Furnace Co. at Midland, Ont.

Showing portion of Cast House, Down Take, Dust Catcher, Stoves, Gas Main to Boilers and Cold Blast Main.

One of the Blowing Engines.

Hamilton Steel & Iron Co., at Hamilton, Ontario.

IRON MINING IN ONTARIO.

Iron Mining in Eastern Ontario. Showing the Calabogie, Wilbur, and Robertsville Mines. The centre photo is of the Stoness-Kent Mica Mine.

GOLD MINING IN ONTARIO.

Belmont Gold Mine : Mill (30 stamps) from southwest. Operated by the Cordova Exploration Company

Interior 30 Stamp Battery at Belmont Gold Mine, Hastings Co. Ontario.

While, naturally, the bulk of this activity must be credited to the older established industries of Nova Scotia, whose exports of pig iron and steel to Great Britain and to Europe will, henceforward, be a conspicuous feature of our industrial progress, the iron mines and furnaces of Ontario have also to record a banner year In 1900 the output of pig iron was 62,386 tons, worth $936,066, while in the nine months of 1901 it rose to 87,888 tons valued at $1,296,344. In December a year ago the Midland furnace of the Canada Iron Furnace Company went into blast and has been steadily producing ever since, thus adding materially to the iron making capacity of the province The Midland furnace, as well as that of the Hamilton Steel & Iron Company, turns out coke iron, while the Deseronto Iron Company is running on charcoal iron alone. The views of the Helen Iron Mine operated by the Clergue Syndicate have been kindly furnished to the REVIEW by the courtesy of the Director of Mines.

Commenting upon the prospects for iron making in Ontario, the Director of Mines in his report for 1901 says :—

"It is pertinent to ask whether these advantages are confined to the United States. Is it practicable for the Province of Ontario, for example, to enter upon the business of making iron and steel on anything like terms of even competition with the republic to the south of us? Even if her undoubtedly large stores of iron ore and abundant deposits of limestone furnish two of the three kinds of raw material essential to the business, will not her coalless formations and distance from the seaboard heavily handicap Ontario in the struggle to supply the world's markets? These are questions which can only be answered by actual experiment, not by balancing conditions on paper. Nevertheless, there are many features which render the prospect before the developing iron industry of Ontario a promising one. To begin with, the home market is large and steadily increasing. The Province of Ontario with its mills, foundries, factories and railways, is a heavy consumer of pig iron. The career of industrial expansion upon which it has embarked must increase that consumption by leaps and bounds, and apart altogether from government assistance by bounties or tariffs, the home producer will necessarily enjoy the advantage conferred by proximity to his customers. There is now no doubt of the quantity and quality of Ontario iron ores, which are found in the western, central and eastern parts of the Province, and of fluxing materials there is no lack.

The prime test of the suitability of any locality for the iron smelting business is the cost of assembling the necessary raw materials, namely,. iron, ore, limestone and coke. In an address delivered at Toronto under the auspices of the board of trade on 15th February last, Mr. A. J. Moxham, general manager of the Dominion Iron and Steel Company of Sydney, C.B., enumerated four points in Canada where the actual cost of assemblage compared favorably with that at Pittsburgh, Pennsylvania, the greatest seat of the ironmaking industry in the United States. Of these, two were in Ontario, on the shores of lake Superior and in the eastern portion of the Province respectively; the others being in British Columbia and at Sydney. According to Mr. Moxham, the "actual freight cost" of assembling the raw materials at Pittsburgh amounts to $3.25 per ton of pig iron made; while at the iron mines on the Ontario shore of lake Superior the cost is given at $1.97 per ton only "or $1.28 lower than the Pittsburgh standard." Apparently in the latter case the cost of transporting the coal only is reckoned, nothing being allowed for either ore or limestone, which gives the comparison an air of being incomplete. As to eastern Ontario, Mr. Moxham states that here "exists ore of great promise, within reasonable distance of the coal of either the Connellsville or Punxsutawney districts. Independently of the local supply is the Canadian lake ore to draw from. This and the coal can be assembled within the Pittsburgh margin. At Sydney of course the freight charges are much below those at Pittsburgh, being indeed only 79½ cents per ton of pig iron, "the lowest assemblage cost in the world for the tonnage under consideration." On the question of steel production for foreign markets the general manager of the Dominion Iron and Steel Company makes out a still stronger case for Sydney when he says that, allowing one and a tenth tons of pig iron to a ton of steel the freight cost of assembling the raw materials for the latter at Pittsburgh is $3 57, to which must be added $2 per ton for delivery at tidewater, making $5.57 in all, while at Sydney the pig iron being already on the seaboard the freight cost of a ton of steel is only a few cents more than that of a ton of pig iron. If these figures be correct, the superiority of Sydney as a steel producing point is sufficiently manifest, and a power has arisen on the Canadian shore of the Atlantic ocean which must inevitably exercise a great, if not a dominating influence, in the iron and steel trade of the world. Exports of pig iron from Sydney to Great Britain have already begun.

It is to be noted that when Mr. Moxham speaks of the "freight cost" he is careful to point out that he means the "actual cost" of haulage to the railway and steamship companies, not the rates charged by them for their services. In all cases the latter must be in excess of the former, and in most cases they are very considerably in excess. This is quite evident when the cost of transporting ore from an upper lake port to a lower lake port, a distance of say 1,000 miles, is given as 50 cents per ton, and the average cost of railway freight at four-tenths of a cent per ton per mile; actual facts being that contracts are now being made for the season of 1901 to carry ore from Duluth to Cleveland for 80 cents per ton, and the rate on iron ore from Eldorado in Hastings County to Hamilton, a distance of 170 or 180 miles at the present time is $1.10 per ton.

When the British-built boats employed by the Lake Superior Power Company to carry iron ore from the Helen mine to Midland last summer returned to England in the fall to engage in the ocean carrying trade for the winter instead of lying up for six months in some lake harbor, they bore cargoes of steel from the works of Andrew Carnegie; and if steel made in the United States can be exported profitably in this way, there does not seem to be any good reason why the same thing cannot be done with steel made on the Ontario side of the great lakes, particularly if the cost of accumulating the raw materials is lower than south of the line. But whether the foreign market is available or not, the home market remains. New Ontario is to be conquered and subdued to civilization. Railways are to be built, requiring iron and steel for rails, bridges, locomotives and cars, mineral deposits are to be opened up and forests are to be felled, pulp factories, sawmills and many kinds of woodworking establishments are to be called into being and equipped with machinery, and above all, great areas of cultivable soil are to be taken possession of by the farmer, whose calling demands manufactured iron and steel in a thousand forms. Old Ontario and New Ontario combined will absorb an immense amount of iron and steel, and even the prairies of Manitoba and the Northwest may yet be cultivated by ploughs and harrows fashioned from Ontario ores. The outlook for the iron industry of the Province was never better than now, and never was so much being done by the industry to meet the situation."

Successful Gold Mining in Ontario.

One of the few capably managed and successfully operated gold mines in Ontario during the past few years is the Belmont mine in Hastings County, owned by the Cordova Exploration Company, Ltd. The extensive development of this property under the management of Mr. Kerr has been already described in the REVIEW. The two views of the 30-stamp battery will be interesting in view of the report that this mill is to be shortly enlarged to 100 stamps.

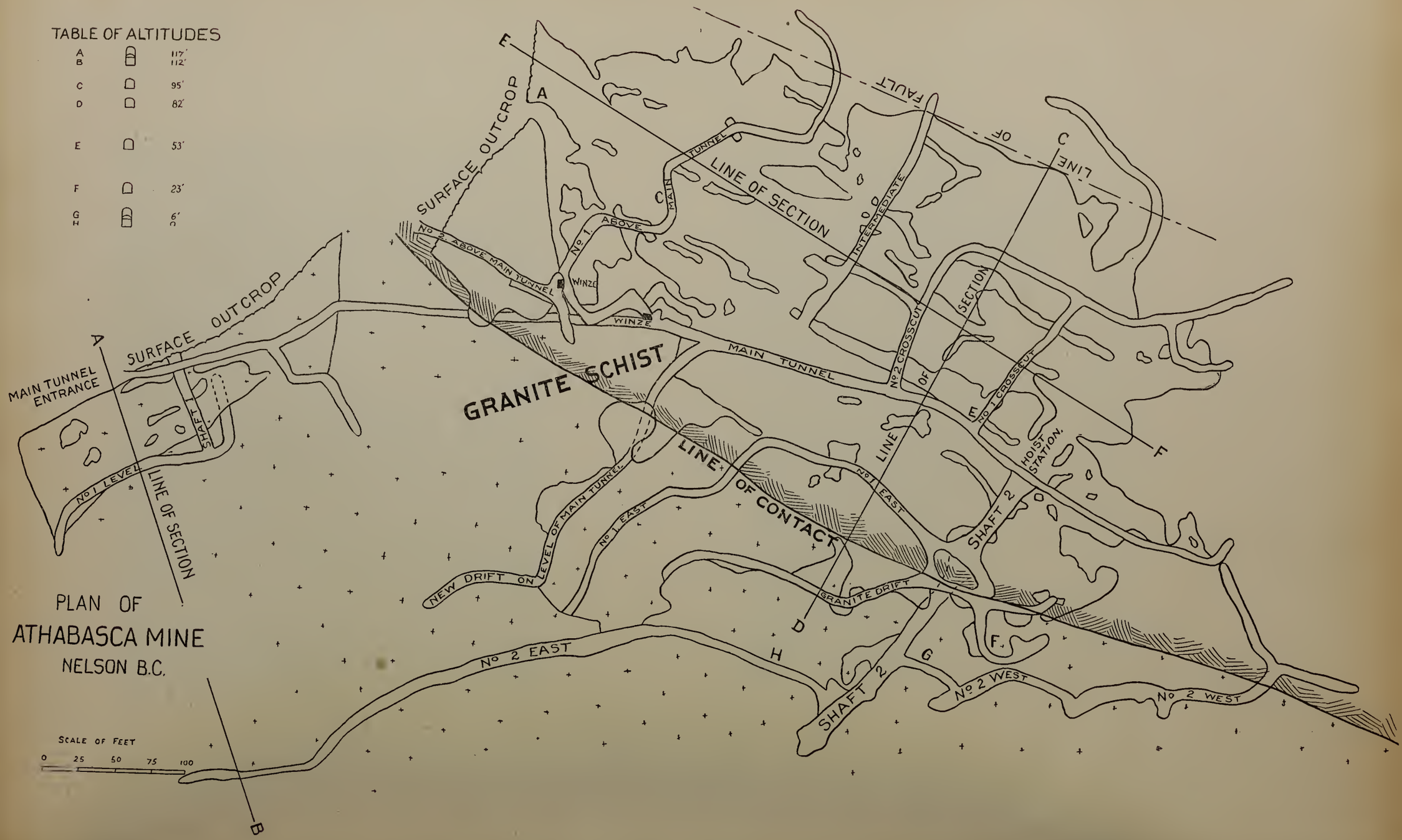


TABLE OF ALTITUDES
A 117'
B 112'
C 95'
D 82'
E 53'
F 23'
G 6'
H 0'
PLAN OF
ATHABASCA MINE
NELSON B.C.
SCALE OF FEET
0 25 50 75 100
SURFACE OUTCROP
SURFACE OUTCROP
MAIN TUNNEL ENTRANCE
SHAFT 1
No 1 LEVEL
LINE OF SECTION
No 2 ABOVE MAIN TUNNEL
No 1 ABOVE
MAIN TUNNEL
WINZE
WINZE
GRANITE SCHIST
MAIN TUNNEL
No 2 CROSSCUT
No 1 CROSSCUT
INTERMEDIATE
SECTION
LINE OF
HOIST STATION.
LINE OF CONTACT
No 1 EAST
No 1 EAST
NEW DRIFT ON LEVEL OF MAIN TUNNEL
GRANITE DRIFT
SHAFT 2
SHAFT 2
No 2 EAST
No 2 WEST
No 2 WEST
FAULT
LINE OF SECTION
A
B
C
D
E
F
G
H

Notes to Accompany One Plan and Three Vertical Sections of the Athabasca Mine, on Toad Mountain, near Nelson, British Columbia.

By E. Nelson Fell, A.R.S.M., Nelson, B.C.

The vein cuts across a well defined contact between a schistose eruptive rock and a more recent granite. This area of schistose rocks and its northern contact with the granitoid area is shown in the reconnaissance map, published in Part B, Annual Report, Vol. IV, of the Geological Survey of Canada (Dr. Dawson's Report, 1889).

It is a narrow vein about one foot in width; the gangue is quartz, heavily charged with sulphides of iron, zinc and lead, containing high values in gold and about the same number of ounces of silver as ounces of gold.

The chief characteristics of the vein are: that it is remarkably well defined; that it is very continuous; that it is broken by innumerable faults, some of which have occasioned considerable displacement of the vein; that it passes from the schist into the granite without any interruption or disturbance: that the values encountered in the granite are good, but not so good as those in the schist, with a tendency, perhaps, to be a little pockety.

In the maps herewith, the granite is indicated by crosses, the schist is in blank.

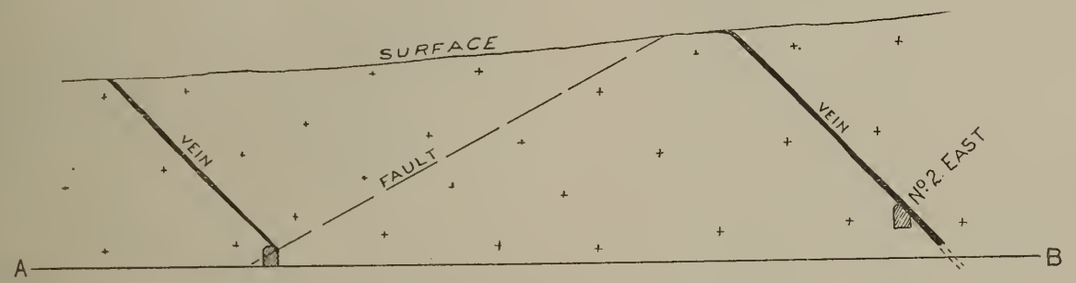
The discovery of the vein was made and work was commenced on a prominent exposure in the granite. A tunnel was run in at the point marked on the plan "Main tunnel entrance," and a shaft was sunk on the vein near the portal and the vein stoped out down to a fault; to recover the vein on the other side of this fault, crosscuts were put in, both on the hanging and the foot-wall side, but without result.

The "Main tunnel" was then carried on into the schist, and, shortly afterwards, encountered what was then supposed to be a second vein. This vein was very flat, and disturbed by a most remarkable series of faults, running in every possible direction. The faults were, practically always, normal; and, in following the vein up to the surface, there was a general tendency to a downward throw at each fault running east and west (section through C.D.) and an upward throw at each fault running north and south (section through E F.).

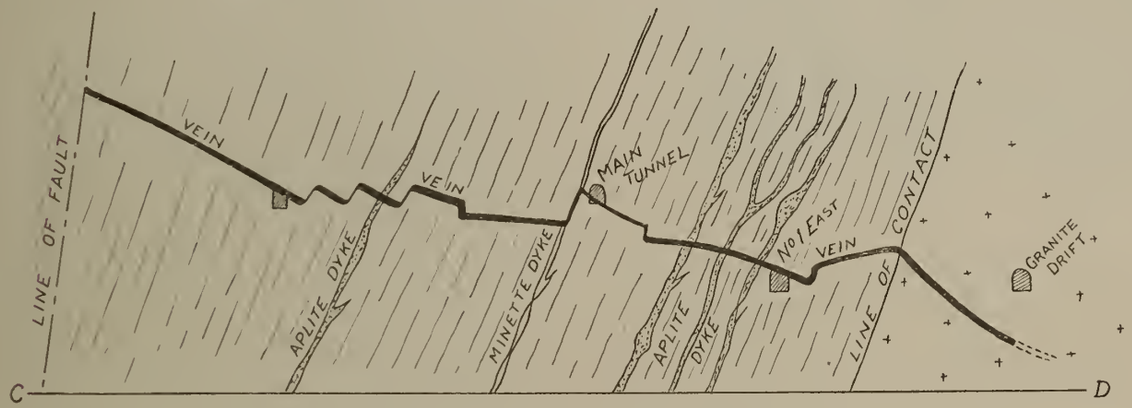
Associated with the vein (in the schist especially) are numerous aplite (acidic) dykes of earlier origin than the vein, and minette (basic) dykes of later origin than the vein. One of the latter follows a prominent fault plane thoughout the mine and is shown in section through C.D. Not only is the vein faulted, but it is subject to remarkable rolls, in the course of which it sometimes assumes a horizontal position and sometimes a sharp "dip upwards," if I may use the expression. This is especially noticeable along the contact of the granite and the schist. As a result of these displacements, drifts are frequently seen at the same horizon, although 150 feet apart on the dip of the vein.

It is hardly necessary to say that to meet these extraordinary conditions, an extraordinary system of mining was necessary, which was inconvenient and expensive and could not have been carried out at all, unless the gold contents had remained persistently high.

At the end of the main tunnel, the ground became unusually disturbed; stoping had to be abandoned here and a small shaft was put down from the point marked "Hoist Station," which ultimately passed into the granite. Along the contact, both in the schist and to a lesser extent in the granite, a remarkable concentration of values occurred which yielded very fine results in the mill; but below the contact in the shaft, and in the drifts to the west of the shaft, the vein was found in patches only, cut off by faults every few feet and thrown by each fault from 50 to 100 feet.



SECTION ACROSS STRIKE OF VEIN IN GRANITE



SECTION ACROSS STRIKE OF SCHIST AND CONTACT

Eastward from the shaft, No. 2 East was carried about 500 feet, meeting the vein in fine condition about 200 feet east of the shaft, and carrying it to the present face, without faults, well defined, with a regular dip of about 45°.

As this work proceeded, it became more and more evident, until there was finally no room for doubt, that this vein was the same as that on which Shaft No. 1 had been sunk, and that we had now come round, on the other side of the fault, to a point on the vein which lay about 220 feet from the point where it faulted. The throw of the vein along the dip of the fault was about 175 feet. The outcrop on the surface was then sought for and uncovered under the wash. This is illustrated

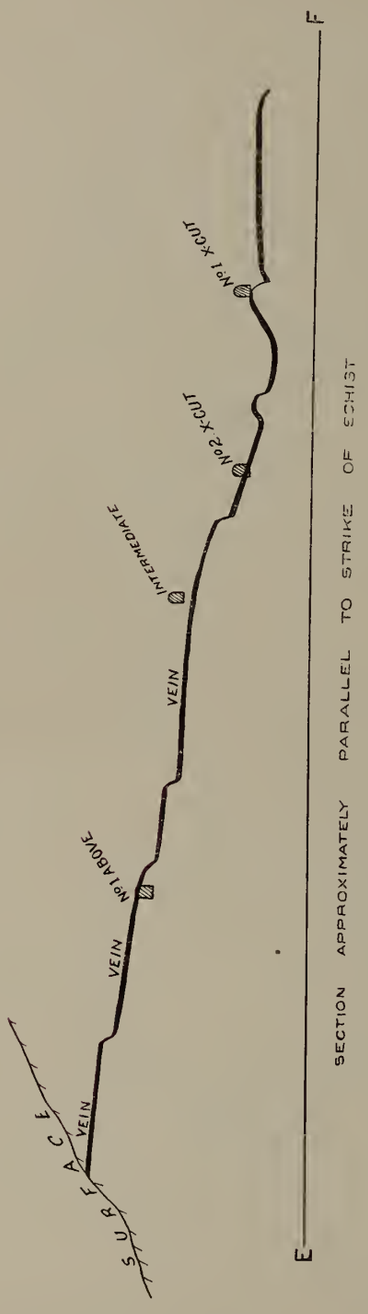
Paper presented for discussion at the ensuing Annual Meetings of the Canadian Mining Institute.

in the section through A.B. It is an interesting matter for speculation as to what the results might have been, had the work originally been done at this outcrop, instead of at the bolder and richer outcrop below. It is not impossible that the history of the mine would have been materially changed.

A few general points may be summed up as noteworthy.

Firstly: that the vein occurs cutting both granite and schist.

Secondly: that there is a remarkable concentration of values along the contact, especially on the schist side.



Thirdly: that the values in the granite do not average as well as in the schist; the vein being inclined to be more uneven, both in size and contents.

Fourthly: that the vein in the granite is found in a more normal condition and is better adapted for mining.

Fifthly: that in the schist the vein is flat and very much disturbed by faults and folds, and finally enters upon an area of ground which is so shattered that all traces of the vein are lost. It is probable that it will be recovered here at some deeper point, approach being made from the granite.

Sixthly: that extreme caution must be exercised in undertaking the opening up of a vein in shattered ground of this kind. Theories of parallel ore bodies and numerous veins may be rudely dispelled by events, and the plan of work must be held continually subject to modification. Only the most shadowy estimates can at any time be made of ore in sight, and the plan of operations can only be outlined in a vague way. To open up a mine of this description is an entirely different proposition to that of opening up a regular ore body. It would appear, however, that the vein, where it is now being worked in the granite, has at last reached a condition of permanency, and it is likely that it will retain this character, as further depth is attained.

I have attempted to outline the doubts and difficulties connected with opening up an ore body of this character. This is a class of mining, however, which opens up attractive possibilities and cannot be neglected. This vein yielded in thirty months $350,000 from 11,500 tons of ore. It is an open question whether the system of limited liability company organization is adapted to a mining proposition of this kind. For conducting large operations on lines which can be definitely and permanently foreseen and laid out, the present system is no doubt to be preferred. But I believe that a system of assessable stock would be found to be more economical and, speaking generally, more suitable for working a property of the kind under discussion.

The maps above referred to were prepared by Mr. H. W. Mussen, superintendent of the mine.

The Prospector's Soliloquy.

"To dig or not to dig, that is the question;
Whether 'tis wiser in the deed to follow
The lodes and bearings of auriferous metal;
Or to keep watch upon the claims of others,
And by attention, jump them?—To sink,—to blast,—
No more;—and by a shot, bring forth to light
Gold, pure gold, and the hundred usual signs
That indicate it—'tis a consummation
Devoutly to be wished. To sink,—to blast:—
To blast; perchance to burst; ay, there's the rub;
For dynamite speaks truth, and barren quartz,
When fuse has run its length, stands forth in all
Its nakedness. There's the delay
Of new machinery, the cost of it,
No water power, wood too dear for steam,
The assayer's test, a partner's contumely,
Nor signs of proffered help, the road to clear,
The insolence of office, and the sneers
Which drive a man to think of seeking death
At the drill-hole's mouth, and quit the world, hoist
On his own petard. Who loves backwoods life,
To grub and rough it with weary thoughts of home,
But that the chance of something turning up,—
The unexpected nugget, to grasp which
All prospectors strive,—captures the fancy;
And reconciles us to discomfort now,
To reap rewards when we are old and grey?
Buoyed up by hope both hearts and nerves are steeled;
And thus, that he who seeks shall surely find
Brings to our minds both joy and sweet content;
And mighty works of great scope and daring,
This end in view, are carried out in fact
Not dreamt of all day long."

Acetylene Mine Lamps.

Since the discovery in 1892 of the process of making calcium carbide in commercial quantities at a reasonable cost, acetylene gas as an illuminating agent has been before the public in many forms and for many uses, perhaps the best known of which is the brilliant acetylene bicycle lamp which has shown its immense superiority in all points over the older forms using oil. It has recently been introduced and is meeting with success in a field where the lighting problem is a difficult one, namely, in tunnels and mines.

Various devices using oil, candles and electricity have been presented to solve the problem. Oil has many advantages—it is cheap, is easily obtainable and the men are accustomed to its use. It has, however, two serious faults. The smoke from it is often so great as to drive men out of small workings, many mines requiring extra ventilation on this account. In gold and silver mines it cannot be used successfully because spilled oil interferes with the separation of the metal. From what figures are obtainable the cost of this method seems to average about 5 cents per miner's lamp for 8 hours use.

In the West, paraffin candles have been generally adopted in mines of precious metals. They largely overcome the difficulty of smoke, lessen the fire risk, and are generally more satisfactory than oil, but are far more expensive. Figures obtained from a silver mine in New Mexico may be considered as fairly representative though others may show wide variation. 350 men are employed and the cost of candles is $3 per man per month, working 30 days.

It would thus at first appear that electricity would be the ideal method of lighting a mine. It has proved satisfactory in many cases, but it has drawbacks. The lights cannot quickly and readily be moved from place to place and withdrawn when a blast is to be fired. The sharp rocks cut the covering and sulphur in the water and powder fumes rapidly destroy the insulation. Conditions of operating vary so greatly that it is difficult to obtain figures which would be even approximately accurate for the cost of electricity per lamp in mining plants, but the general opinion seems to be that a 16 c p. electric light costs from 8 cents to 10 cents per 8 hours.

The ideal light must be bright and clear, free from smoke or smell, easily transported and one which is inexpensive in first cost and cost of operation. It must above all be capable of use by inexperienced men and those found on the ground. It must be safe, durable and economical.

Acetylene gives a light the brilliance of which is beyond question and on analysis the light is found to be the nearest approach to sunlight of any artificial light yet produced. With regard to its effect on the purity of air in confined spaces, we quote from a recognized authority, Prof. Vivian E. Lewes: "The researches of Dr. Grehant "have shown us that when burning with a smokeless flame, no carbon "mon-oxide can be detected in the products emitted by the com- "bustion of acetylene, and its sanitary position will, therefore, be "defined by the amount of oxygen abstracted from the air and carbon "dioxide produced, as compared with other illuminants. Taking the "average sized room which would be well lighted by an illumination "equal to 64 standard candles, we find that this amount of light from "the various illuminants would show the following results:—

	Oxygen removed from air. cubic foot.	Products of water vapour.	Combustion carbon dioxide.
" Sperm candles	38.5	26.2	43.6
" Paraffin oil	24.9	14.0	39.8
" London gas—Batswing burner	26.1	29.4	19.2
" " " Argand "	23.0	25.6	17.0
" " " Regenerative burner	10.6	8.3	5.2
" " " Incandescent "	3.1	4.6	1.8
" Acetylene	5.0	2.0	4.0 "

The incandescent electric light of course is not mentioned as it is ideal in this respect, but we see that with the exception of the incandescent mantle gas burner, nothing approaches acetylene. It might also be said in justice to the objects of this paper that the paraffin oil mentioned in the table was not burned in smoky miners' lamps where obviously its bad effects would be largely magnified.

Attempts have been made to perfect an acetylene lamp which would endure the severe service imposed by conditions found even in the best tunnels and mines The Baldwin Acetylene Mine Lamp, illustrated herewith, has been in use for the last year and during this time under close investigation, the results have been uniformly satisfactory. These lamps are now offered in Canada by The James Cooper Manufacturing Co., Ltd., of Montreal.

This lamp is made in two styles—the smaller, known as the "Superintendent's Lamp" is intended for superintendents, surveyors, mine bosses, inspectors and others moving about from place to place. It is useful for surveying purposes, as the flame when looked at end on, is only about ⅛ inch in diameter and there is a metal point on the lamp, just under the centre of the flame, which permits of its being set very accurately over a surveying point. It weighs 9 oz. and will hold a charge of carbide sufficient to keep it burning at full brilliancy for four hours. It takes only a couple of minutes to clear out and recharge the lamp with carbide and fill the tank with water

The larger form, or "Gang Lamp," is intended for headings, enlargements, stations and switching points where a large volume of light is required to permit several men to work. The No. 8 lamp, burning ½ ft. per hour, gives about 20 candle power. The No. 7, burning ¼ ft. per hour, gives slightly more than half this amount of light, or about as much as 6 sperm candles, or three oil lamps. The actual illuminating effect is far greater since it gives off absolutely no smoke to deaden the light.

These lamps are solidly made of cast iron to stand severe usage and one may be turned upside down or rolled about on its side without fear of the light going out or in any way affecting its burning qualities.

Relative to the cost of operating, it has been found that 1 lb. of calcium carbide will easily give 4 cubic feet (often more) of gas. Carbide will cost in quantities about 6 cents per pound at the mine. No. 7 lamp holds ½ lb. of carbide and has a burner consuming ¼

cubic foot per hour, or a run of 8 hours for 3 cents. No. 8 holds 1 lb. of carbide, and has a ½ foot burner and will cost 6 cents for 8 hours light.

To afford a further comparison of operating costs, we select the New Mexico mine already referred to, working 365 days in the year, and consider it using Baldwin lamps burning ½ lb. of carbide per day :—

FIRST YEAR.

Candles for 350 men at $3 per month per man for 1 year..		$12,600 00
Say 365 No. 7 lamps at $5 cost.....	$1,825 00	
175 lbs carbide per day for 1 year.....	3,832 50	
		5,657 50
		$6,942 50

SECOND YEAR.

Candles, same as first year.....		$12,600 00
175 lbs. carbide per day.....	$3,832 50	
Repairs, say 50 cents per lamp on 350 lamps.	175 00	
		4,007 50
Saved by using Baldwin lamps.....		$8,592 50

These lamps have been extensively adopted by the contractors of the New York subway and have proved most suitable for their severe usage.

CORRESPONDENCE.

Granby Consolidated.

SIR,—I am very glad to see you taking the strong stand you do on the question of the over-capitalization of the Granby Consolidated M. & S. Co. Surely there can be no question in the mind of any mining man that this company is over-capitalized. Some mining publications are strenuous in pointing out the damage done to the mining interests of British Columbia in the abstract by over-capitalization, but when a conspicuous instance is brought before them they will do all they can to shield and whitewash the individual company. Presumably this is done to uphold the mining interests of British Columbia, but really to the damage of those interests.

With regard to the actual values of the ores of the Knob Hill and Iron sides mines, from the meagre information that has been published from time to time as to these values mining engineers could only come to the conclusion that they are now being mined and smelted at an actual loss. No information as to values has been published lately, as far as I am aware; but there is a rumor that a chute of better ore has been encountered and has been worked during the last few months, and this may account for the statement that the new plant is being erected out of profits.

The most important feature with regard to these properties, that is as it affects the mining interests of British Columbia, seems to me to be as to the future working of these veins. It seems that they are being worked at present as quarries. Now this system must sooner or later come to an end and some definite system of mining must be adopted. Every experienced mining engineer knows that large veins of that character must be mined on a carefully laid out plan in order to render them safe to work. Can any mining engineer derive any system of permanent mining which will not materially increase the cost of extraction? And will not that increased cost absolutely preclude any possibility of mining and smelting these very low-grade ores not only at a profit, but without loss? There would seem to me to be no possible honest reason for withholding the fullest information, not only from the shareholders, but from the general public. If these ores are being mined at a loss it may seem advisable to the directors to withhold any information which would show the worthlessness of the property. But if these ores are being treated at a profit, let the directors publish the fullest returns of the actual values of the ores and of the cost of production.

M. E.

Vancouver, B.C., 16th Dec., 1901.

Dr. Ami's Letter to the Mining Society.

SIR,—That was a suggestive letter from Dr. Ami, Assistant Palæontologist to the Geological Survey, read at the recent meeting of the Mining Society of Nova Scotia; one of those letters which both friends and acquaintances would speak of in words with the syllable "un" before them. It reminds one of an all-night vigil with an open-mouthed infant, followed by burnt porridge and cold coffee at breakfast. A letter that gives relief in the writing, but is better dropped in the wastepaper basket than in the post office.

At their previous meeting the Mining Society had complained that certain maps of Nova Scotia, prepared many years ago by Mr. Hugh Fletcher of the Survey, were kept back and not issued. Dr. Ami's name did not appear in the complaint, nor was he singled out by inference; it did not occur to the mining men of that province that he, as an assistant, was responsible for the delay, or called on to explain or tax a confrere on the Survey. No one can complain if differences of opinion arise respecting the age of any series of rocks. It is to be expected under the varied conditions, and only proper that discussion occur among the members of the staff. The earth's records, we are told at the Sussex Street buildings devoted to the study of her history, are badly injured by time, many chapters lost and numerous pages misplaced; that in the investigation it is necessary to divide up the work and specialize certain branches, that this division narrows the vision and may lead to an individual inability to estimate relative importance, and give a touch of jealousy not wholly to be deprecated since it incites and stimulates rival investigators.

Ninety-nine miners out of a hundred don't care, ahem! whether certain strata are upper Devonian or lower Carboniferous: whether they correlate with those of the same name in Europe or not; but they do object to changes of names, new terms in place of those made familiar to them by use in previous reports on Canadian geology. The schools may amuse themselves if they like over such a question; the prospector wants it understood that having once been told that the Mispec beds of New Brunswick are Devonian in Canada, and, having held that belief for thirty years, they have to remain Devonian to the Canadian, and that beds elsewhere in Canada of the same age shall be called by the same name. The Canadian miner is too much in earnest for his own interests to care what outsiders may say of the nomenclature he has accepted, and especially when he finds they differ among themselves as to the terms he should employ.

Subsequent to the publication of Dr. Ami's letter, there appeared in the press a correspondence with the Secretary of the Mining Society in which he cites the literature of the subject, and, as much of it is technical, it will be sufficient to direct the attention of those enough interested and disposed to investigate further to the references made in the Secretary's letter. The italics in Dr. Ami's letter are mine :—

"OTTAWA, July 9, 1901.

"MR. GEORGE W. STUART,

"Vice-President N.S. Mining Society,

"SIR,—I notice in the April number of *The Canadian Mining Review*, Ottawa, your interesting remarks on the work of the Geological Survey of Canada. You have no doubt a copy of the same, and I shall not repeat your statements, but I desire humbly to draw your kind attention to your reference to certain maps which 'for some reason' you state were not issued, but withheld. The Summary Reports of the Geological Survey Department for 1886 to 1900 show clearly the reason why.

"Mr. Fletcher has only to color the carboniferous areas as such, and not 'Devonian' as he insists on *in spite of all palæontological and other reasons*, and the maps can be issued. The maps would have been issued in 1896 or 1897 had he chosen to accept the views of those *who know*. It is not a great matter, but one of sufficient importance, that *we do not wish to be made the laughing stock* of the world by placing in one geological system what is decidedly and without hesitation in another. That is the simple statement as it is. There is no "mystery" about the delay in publication. The public has been told wherein the cause of delay rests, and unless Mr. Fletcher chooses to accept the verdict of that mass of evidence which proves the strata "carboniferous" which he insists on coloring 'Devonian" with very few exceptions, for we have found typical Devonian in Mr. Fletcher's area—the very object of my researches having been to look for Devonian in Nova Scotia for the past six years.

Unfortunately certain geologists, working in Nova Scotia, have pinned their faith and geological beliefs upon old work in New Brunswick without checking that work themselves and have fallen into grave error. There is now no reason for delay—nor has there been except on the part of those geologists who may wish to place in the Devonian entire formations which are truly, unequivocally carboniferous.

"Very truly,

"(Signed) H. M. AMI."

Halifax, N.S., 21st Dec., 1901. COLLIERY MANAGER.

[If, as Dr. Ami asserts, this letter was strictly a private communication addressed to Mr. Stuart personally and for his own information only, it is difficult to understand how it came to be discussed at an open meeting of the Society. At all events the publicity which has been given to it is regretable, and has served no good purpose. The responsibility for the delay in the publication of these valuable maps of Mr. Fletcher's rests with the Director of the Geological Survey, and, as no appointment to this office has been made since Dr. Dawson's death, the proper course the Society should take is to address the Hon. The Minister of the Interior. We have no doubt when Mr. Sifton learns the urgent desirability for the immediate publication of these maps, and the petty, almost childish, reasons which have so far prevented their issue, he will have the matter rectified.—EDITOR.]

MINING ASS'N MEETINGS.

Canadian Mining Institute.—The Nominating Committee appointed by the members have recommended the following to fill the vacancies in the Board of management for 1902: President, Mr. Chas. Fergie, M.E., Intercolonial Coal Co., Westville, N.S.; Vice-Presidents, Mr. Eugene Coste, M.E., Prov. Nat. Gas and Fuel Co., Toronto, Ont., Mr. R. R. Hedley, Metallurgist, Hall Mining & S. Co., Nelson, B.C.; Treasurer, Mr. J. Stevenson Brown, Montreal; Secretary, Mr. B. T. A. Bell, Editor, Canadian Mining Review, Ottawa, Ont. *Council*: From British Columbia, Mr. Frank Robbins, M.E., North Star Mining Co., Kimberley, B.C., Mr. Frederick

Keffer, M.E., B. C. Copper Co., Anaconda, B C.; from Ontario, Mr. A. P. Turner, Canadian Copper Co., Sudbury, Ont., Mr. E. A. Sjostedt, Metallurgist, L. Superior Power Co., Sault Ste. Marie, Ont.; from Quebec, Mr. J. B. Porter, M.E., McGill University, Montreal, Mr. B. Bennett, King Bros. Asbestos Mines, Thetford, Que.; from Nova Scotia, Mr. W. L. Libbey, Brookfield Mining Co., North Brookfield, N. S., Mr. Cornelius Shields, Dominion Coal Co., Glace Bay, C.B.

Mining Society of Nova Scotia.—This Society held a successful meeting in Halifax on 27th ultimo. A committee was appointed to interview the Hon. A. Drysdale, K.C. the new Commissioner of Mines with regard to certain much needed reforms in his Department, among them the following: (1) A government assay office (2) Technical education. (3) Encouragement to deep mining (4) An improved departmental report. (5) To revive the legislation of 1885, requiring a record of plans of the working of all metalliferous mines. (6) That in future appointments to the position of deputy inspector shall be subject to passing a technical examination. (7) That the present inaccurate maps and plans of the mine office be rectified. (8) That all rentals be made payable on two fixed days in the year.

British Columbia Mining Association.—At the annual meeting held in Nelson, B.C. on 7th instant, the following officers were elected: J. Roderick Robertson, President; Frank Robbins, 1st Vice-President; Bernard Macdonald, 2nd Vice President; Executive Committee, George Alexander, George Hughes, E. B. Kirby, S. F. Parrish, Fred Keffer, James Cronin, J. J. Campbell, J. Roderick Robertson; R. F. Tolmie, Secretary. Among the questions discussed at length was that of the proposed lead refinery.

Assayer's Association of B. C.—At a meeting of Certificated Assayers in British Columbia held at Nelson recently, an Assayer's Association was formed and the following officers elected: President, Mr. Herbert Carmichael, Provincial Assayer, Victoria; Vice-President, Mr. Alex. McKillop, Nelson; Secretary-Treasurer, Mr J. Cuthbert Welsh, Trail. Council: Mr. A. A. Cole, Rossland; Mr. H. Harris, Nelson; Mr. Thomas Kiddie, Van Anda; Mr D. Lay, Kimberley; Mr. H. W. Mussen, Nelson; Mr. Wm. F. Robertson, Provincial Mineralogist, Victoria; Mr. G. Sundberg, Greenwood; Mr. Howard West of Sandon.

Mining Society of McGill.—In accordance with a resolution adopted at the last annual meeting of this Society, the members of this Society will in March next become affiliated with the students branch of The Canadian Mining Institute.

General Mining Association of the Province of Quebec.—The annual meeting of this organization will be held in Montreal during the first week in March next.

COMPANY NOTES.

Port Hood Coal.—Mr. John Johnstone, General Manager, writes under date of 4th instant, correcting item in our *Coal Mining and Trade* correspondence in last issue:—

"*First.*—The only development work which is and has been done since June last was the ordinary driving of levels north and south, which have been extended from the slope on the north side 1,500 feet, and on the south side 1,100 feet, and which have given ample space for four balances, each with eleven rooms turned and capable of giving an output of 400 tons per day. But it was owing to an insufficient number of miners, and not because of insufficient surface accommodation, as stated that any hampering might have occurred. While we had but few tenement houses for workmen the company erected in the early springtime a boarding house capable of comfortably accommodating 100 men, yet at no time had we more than 40 men occupying it. The menu and cost of same to workmen were considered fair and the men would have no reason to avoid it on these scores.

Second.—The reference to the recent damage to shipping pier is news to those living in this vicinity, and is entirely incorrect. The said shipping pier, your correspondent or informant to the contrary notwithstanding, has during the past summer been extended 135 feet into 24 feet of water, the extension being built by piling upon which were erected pockets the entire length with a capacity of 500 tons. So that since June last there has not been any difficulty in shipping coal from said pier in such tonnage as could be secured in keeping with the output, which was restricted only as above explained.

Third.—Reference to the slope being down 800 feet and being carried further, is also incorrect, as the slope in December last was down 1,150 feet, and has since been driven no further, the management considering they had sufficient room for the output already stated. Further sinking was therefore stopped and attention turned to opening up work as above explained. It is also incorrect to state that the capacity of the mine is 200 tons per day. But it would be correct to state that the output is, and has been, 200 tons per day owing to the causes mentioned.

I may add that the Port Hood Coal Company has not only been enabled to ship their coal by water direct from their colliery, but that they have also shipped by rail, and are still doing both, and have sent their coal along the line of the I. C. R. as far as Quebec and other important points, all of which shipments have given good satisfaction.

When it is remembered that in March last there was but little indication of Bankhead, engine and boiler houses, much less engines and boilers, it certainly shows that a very large amount of construction work has been carried on in addition to the shipping of coal. At this colliery there is a bankhead with tipple screens and picking belts with engine and boilers to raise 600 tons per day. The boilers and engine power are capable of handling 1,000 tons per day, so that it is only a question of opening up the mine to enable its being done, and undoubtedly such is the Company's intention, as they propose at the close of navigation, which will be at the end of December, to at once begin to sink the slope a further distance of 600 feet. This done, and additional levels turned and driven sufficiently will enable them to materially increase their output. It may be further stated that we have our pumps driven by compressed air, a compressor having been installed for the purpose, and also for the purpose of experimenting with coal mining machines, which said experiment has been made with most satisfactory results.

The James Cooper Co. placed one of their Ingersoll Sergeant G 4 cutting machines at this colliery, and operated by one of their men he succeeded in undercutting in the third shift three rooms 12 feet wide and 4½ under, the seam lying at an angle of 23 degrees. As the machine was rough on account of its not having been in use heretofore, the test was considered a very good one, and the result obtained will largely induce the Company to introduce the machines next year."

Centre Star Mining Co.—The accounts for year ended 30th September last as submitted to the shareholders on 26th ultimo are as follows:—

ASSETS.

Centre Star Mine	$3,300,540 00	
Cash in Bank of Toronto, Toronto.	10,603 90	
Stores on hand as per Inventory.	38,329 99	
Machinery, Buildings and Equipment	249,517 57	
Furniture of Offices	1,360 90	
Invested in War Eagle Hotel	12,500 00	
Accounts Receivable	1,531 25	
		$3,614,383 61

LIABILITIES.

Capital Stock	$3,500,000 00	
Bank of Toronto, Rossland	40,728 50	
Accounts Payable	13,526 33	
Profit and Loss	60,128 78	
		$3,614,383 61

PROFIT AND LOSS ACCOUNT.

DR.

To Balance brought forward		$182,122 10
" Direct costs of Mining & Development	$258,349 23	
" Fixed and General Expenses, Aug. and Sept. (Mine closed)	5,432 71	
" Diamond Drill Prospecting	2,184 28	
" Extralateral Litigation	7,685 30	
" Other Legal Expenses	2,290 49	
" Mine Accidents	925 50	
" Consulting Engineers' Fees	1,850 00	
" Managing Director's Salary (3 yrs.)	7,500 00	
" Travelling Expenses	239 19	
" Interest and Exchange	588 70	
" Auditors' Fees	154 00	
" Toronto Office Expenses	1,128 93	
" Trail Smelter Examination	2 670 79	
" Sundry Expenses	753 60	
" Amount written off for depreciation in Plant, etc	22,019 54	
		$313,772 26
" Dividends, Nos. 2 to 6	$175,000 00	
" Balance carried Forward	60,128 78	
		235,128 78
		$731,023 14

CR.

By Net Proceeds from Ore Sales	$694,643 71	
Less Provincial Ore Tax	13,889 92	
		$680,753 79
" Transfer Fees		269 35
" Premium on Capital Stock sold in 1899		50,000 00
		$731,023 14

Le Roi.—The directors of the Le Roi Mining Company have received the following cable from Mr. Frecheville, dated Rossland, November 25th:—Auditors make profit from mine and smelting works for the year ended June 30th, $586,000. This was used for improvements. All the plant first class. I estimate the reserves of ore at date above the 900 feet level 484.000 tons of 2,000 lbs.; value per ton, $11.75. The total cost per ton in the future ought not to exceed $9.00 dols. The lowest level in the mine, so far as driven, shows chute of ore 170 feet in length, 24 feet in width; assays average $15.75 per ton. Shaft is down 1,050 feet. Will start driving levels as early as possible. Inventory, November 23rd (at), smelting works shows ore, matte on hand and in transit, and supplies, $1,045,000. At the mine, low-grade ore dump, $100,000 net.

The directors wish to give the following explanatory details. Simultaneously with the examination of the mine by Mr. Frecheville, an audit of the books of the company at Rossland has been conducted by Messrs. Price, Waterhouse and Co. Their audit shows a profit for the year ended June 30th, 1901, of $120 576, all of which has been expended in improvements on the property, the result being that the mine is thoroughly well equipped with all the most approved modern machinery, and the capacity of the smelting works, which are excellent in construction and design, and fitted with all the latest labour-saving appliances, has been largely increased. The 900 feet level which is the lowest level as yet opened up in the mine, appears to the directors to be highly satisfactory the lode, as far as tested, being of good width and high grade.

Mr. Frecheville, in a letter to the board, says that the pay chute on this level started with a width of 12 feet, and in the 170 feet of driving done it

has opened out to a width of 35 feet in the face. This, of course, is a matter of the most vital importance in estimating the future profits of the mine, showing as it does that the values of the ore are more than maintained at this, the greatest depth exploited. The liquid assets, as given by Mr. Frecheville, amount to £235,596 In addition to this, there is about £20,000 owing to the company by other companies, which will shortly be paid. These assets exceed the total liabilities of the company by approximately £5),000. A report on the property by Mr. Bernard MacDonald, the late general manager, was published on the 2 ,rd inst. This report was received at the London office on August 24th, and therefore by the board as constituted before the extraordinary general meeting of shareholders, held on August 29th. The report was accompanied by a statement of accounts covering a similar period, and these were immediately handed over to the auditors of the company for examination. The auditors subsequently informed the board that they were unable to accept the accounts in their then form, and at ther request Mr. MacDonald was written to asking for further details. This report from the auditors was made, to the board as constituted after the extraordinary general meeting above mentioned. At that meeting Mr. Frecheville had been appointed by the shareholders to examine and report on the property, and the directors were of opinion it would not be right to issue Mr. MacDonald's report and balance-sheet without further confirmation.

Le Roi No. 2 (B.C.).—December 2nd. Monthly shipments of ore 4,870 tons. Contents 2,483 ounces gold, 8,770 ounces silver, 123 tons copper. Gross value $95,500. Deduct smelting charges, $40,250. Cost of mining, $15,250. Total, $55,500. Net profit, $40,000.

Dominion Coal.—This company is the largest organization of its kind in the Dominion with its mines in Cape Breton, Nova Scotia. The effect of the good times on the securities of that company can be traced in the price movements in the Montreal Stock Market. There are excellent reasons for believing that the financial position of the company has been much improved during the past year and that had a great deal to do with the appreciation in the value of the company's shares The company pays 8 per cent. per annum on the $3,000,000 of cumulative preferred stock, but so far has paid nothing in the way of dividends on the $15,000,000 of common stock. Notwithstanding that the price of the common has been one of the strongest features of the local stock list for some weeks, and the market is believed to have absorbed considerable quantities of the stock offered by sellers in the Boston market. There is reason to believe that Canadians hold the bulk of the stock of the company now. Early in the present year the stock was selling between 34 and 35 At that time the common shares would then be worth as a whole $5,250,000. So great has been the confidence in the future of the company and its capacity to eventually pay the common shareholders a dividend, the value of the shares has risen to between 47 and 48. The value of the shares may be now placed at $7,050,000 on the basis of 47 per share. This shows a total appreciation of $1,800,000 in their value. To that amout must be added the enhanced value of the preferred shares which have also improved considerably. At the first of the year they were selling at 109, now they are worth 120 or more a share. Their total value has accordingly jumped from $3,270 000 to $3,600,000, or a rise of $530,000 Adding the two amounts together makes a total appreciation of $2,330,000, not a bad showing for the past twelve months.

Molly Gibson.—The adjourned Annual General Meeting was held at the Windsor Hotel, Montreal, November 30th. It was decided to defer the building of a smelter until the silver-lead situation assumes a more stable basis. There are 450 tons high grade ore sacked ready for shipment and 4,200 tons second class ore on dump. All work is now being done by contract, the company having secured very satisfactory terms. No ore will be shipped until better prices than those now ruling can be obtained. Thomas Kelly, Winnipeg, was elected to fill the vacancy on Board of Directors caused by resignation of J. H. Brock. Number five tunnel has cut the lead and drifting along it is now being pushed. The ore here averages 126 ozs. silver and 17 per cent. lead. The uncovering of the lead in this new tunnel gives the vein a total length of 2,100 feet and depth of 850 feet. The average width being about 16 inches of ore ; there are estimated to be about 225 000 tons in sight. Number six tunnel, 250 feet below number five, will soon be started and it is expected that the two veins will come together there as the Florence vein is vertical and the Aspen dips toward the Florence.

Winnipeg.—The Winnipeg mine during the month of November shipped seven cars of ore to Trail and also sent a trial shipment of 40 tons to the Greenwood smelter. The eight cars yielded the company $1,800 over freight and treatment. The average value of the November shipments was the best yet secured, and although the tonnage shipped was under the average of the last three months, yet the gross receipts were $300 above the monthly average. Shipments to the Trail smelter are about to cease, the company having secured more favorable freight and treatment rates from the Greenwood smelter, and as soon as the new additions to the Greenwood smelter are completed the Winnipeg will ship to it.

Baltimore and Nova Scotia —This company, successor to the Guffey-Jennings, late owners of the Lake Lode Mine, Caribou district, has the vertical shaft down 650 feet. The company will probably not tap the lode again, until 750 feet. A winze has been sunk on the slope 300 feet west of the shaft on the 500 ft. level to a depth of 90 feet. A large amount of other development work has been done. Another vein apparently equally as valuable as the Lake lode has been opened 700 feet south, and is tapped by shallow shafts in 6 places, proving continuity for 1,100 feet. The company will have in operation in some 6 or 8 weeks a 40-stamp mill, with all modern improvements and will probably cyanide the tailings The cost of the mill will be about $60,000. A 14-drill air compressor is being installed at the head works. The principal owners are Baltimore, Md. men. The general manager is L. W. Getchell, and the secretary-treasurer is A. S. Dunham, of Boston.

Black Cock.—The annual meeting of the Black Cock (Ymir, B. C.) Gold Mines, Ltd., was held this month at the offices of the company, Rossland. Mr. A. J. McMillan, the chairman, presided. The report and accounts for the year ending September 30th last were presented by the Secretary, W. Tomlinson, and after consideration were adopted. The following directors and officers were elected for the ensuing year: A. J. McMillan, Chairman; A. Julien, Vice-Chairman, Mayor Lalonde, A Audet and J. L. G. Abbott, Directors; W. Tomlinson, Secretary. It was stated that negotiations were in progress looking to the resumption of work on the property, which is one of the best known in the Ymir district. Already several hundred tons of ore of high grade have been shipped from the Black Cock mine to the Nelson and Northport smelters. The outcrop of ore on the surface is one of the best defined in the district, and in the opinion of mining men who have visited the property it is only a question of time and money before the Black Cock will develop into one of the large mines of the district. The ore is almost identical with that of the Ymir mine, situated about one mile distant. The last shipment of ore from the Black Cock mine averaged $40 to the ton.

North Star.—Directors have reduced usual dividend from 3 per cent. quarterly to one-half that amount. The causes assigned are the reduction in the price of lead and the discontinuance of work caused by a disagreement with the miners Development work will be pushed as soon as the trouble is ended. The directors for the ensuing year are D. D. Mann, W. A. Mackenzie, Senator Thibadeau, H. S. Holt and C. E. L. Porteous.

Athabasca.—The attempt to reconstruct for a second time, the Athabasca Company in London, has been effectually frustrated by the action of a Mr. E. E. Weber, of New Westminster who, with the knowledge and consent of other Canadian shareholders, applied for and obtained an order from the courts for the winding up of the concern. In the petition suppo ting the application for the winding up of the company, it is stated that the debts of the company are in the neighborhood of $50,000, the greater proportion of which is owing to people in this Province. It is further stated as believed by the petitioner, that it is the intention of the liquidator of the Athabasca, who was appointed at a meeting of the company held in London on the 7th of August, to convey the property of the company to a new company to be formed, which new company will pay for the same by the issue of stock assessable to the extent of five shillings or more on the pound, which assessment if made will produce $125,000 or more. This call, it is set out, is excessive and unnecessary, and payment thereof will be beyond the means of many of the shareholders of the company, and that through failure to make payment of such call such shareholders will lose their interest in the company. The petitioner further sets out his belief that in the event of the company being wound up that its property could be sold at a price which would pay all of its indebtedness and leave a considerable margin to divide among its shareholders. The granting of the winding-up order by the courts will seem to set at rest the repeated reports that an early start is to be made in the resumption of work at the mine, and that when it does resume either the Canadian or English shareholders, or both, will be out of it. Locally, the opinion seems to be that the English shareholders are anxious to proceed with reorganization with sufficient assessment on the stock to wipe out all the liabilities and leave a substantial margin for development purposes, but that the Canadian shareholders are more concerned in getting out of the concern without further loss.

Granby Consolidated.—The second furnace will be blown in early in the new year and capacity of the present plant doubled. The smelter was blown in February 18th of the present year. From that date to October 31st it has treated 91,715 tons. To come down to months the last two will suffice to give an idea of the daily tonnage treated. In September the total amounted to 11,823 tons, or a daily average of 393 $\frac{1}{10}$ tons. For October the total was 12,660 tons, being an average of 408 tons a day. On October 18th Mr. Paul Johnson, M E., manager of the smelter, believed he established a world's record for a single-blast furnace of the size in use here. On that day 504 tons of ore, coke and slag were run through. Of this amount 450 tons were ore.

MINING IN NOVA SCOTIA.

Mr. J. R Stuyversant who has been successfully cyaniding old tailings at Caribou during the past summer and has cleaned up 2,025 ounces of gold, has made arrangements with the Richardson Gold Mining Co. to buy their tailings after they leave the plates. Mr. Stuyversant is getting out the plans for a 150 ton plant which he will at once proceed to erect.

Mr. Harry Saunders has severed his connection with the St. Anthony Gold Mining Co.

The National Mining Co. have put in an air compressor in their mine at Mount Uniacke and will erect a small cyanide plant. They have struck a new ore chute in the west end of the mine, a trial run from which gave 2 ounces to the ton.

The East Lake Mining Co. at Mount Uniacke cleaned up 90 ounces last month.

The Great Belt Mining Co. at Mount Uniacke have their 30 stamps running and have made two clean ups of 100 tons each giving 10 and 9 ounces respectively.

The Mic Mac Gold Mining Co., successors to Cashon Hines at Leipsigate returned 320 ounces for the four months ending September 30th.

The Baltimore and Nova Scotia Mining successors to the Guffey Jennings Mining Co. have completed their new 40 stamp mill and propose adding a cyanide plant in the spring.

We are pleased to be able to chronicle the fact that the case of McKenzie vs. E. and C. Thompson has been settled out of Court. We shall expect to hear of some more phenomenal returns again now from their Jubilee Mine at Renfrew.

The Touquoy Mining Co. returned 142 ounces from 216 tons for October.

The railway connecting the Richardson Mine with Isaacs Harbour is completed and the engine has arrived. The company will now be able to get their coal to the mine and their concentrates to the harbour more cheaply than by the old method of carting.

The Evangeline Gold Mine which was recently purchased by Mr. Link is in the hands of the Sheriff.

Messrs. Siduey Smith *et al* who erected a 100 ton cyanide plant at Waverley have closed down, having treated some 1,700 tons and obtained a product of 5 ounces.

MINING SOCIETY OF NOVA SCOTIA.

A Remarkable Letter from Dr. Ami—Government Assistance to Deep Mining—The Payment of Rentals—Mines Report, Government Assay Office and Other Matters Discussed.

A meeting of the Mining Society of Nova Scotia was held at the Halifax Hotel, Halifax, on 28th ultimo, Mr. W. L. Libbey, President, in the chair.

Among those present were :—Messrs. H. S. Poole, Geo. W. Stuart, A. A. Hayward, Charles Archibald, Charles Starr, R. H. Brown, Charles Fergie, Alex. McNeil, Geo. E. Franklyn, F. H. Mason, H. D. McKenzie, H. M. Wylde, G. Troop, M. R. Morrow, and Mr. Holland.

The Secretary read the minutes of the last meeting, and on motion they were approved.

WHY MAPS WERE DELAYED.

Mr. Geo. Stuart—I might report that I had a letter from one of the officers of the Geological Survey Department, and although it was written to me personally, it occurred to me that under the circumstances it ought to be laid before this Society. It is a letter from Dr. Ami, of the staff, giving his reasons why certain maps have been withheld. It was addressed to the President of the Society on the outside, while it is addressed to the Vice-President on the face of it. I wrote to him I thought it was a matter that should come before the Society and if he had no objection I would place it before this meeting. I would like to make it clear that I wrote Dr. Ami asking permission to use this letter before this Society. As he has not replied to my letter, of course I take his silence as consent that I may do so. I had a short interview with Mr. Fletcher and he assures we that the maps are in process of issue and that there will be no material change in the findings of himself and others of the staff, so I expect they will be issued at an early date.

The Secretary then read Dr. Ami's letter (reproduced elsewhere).

Mr. Hayward—That may explain the delay with reference to coal measures, but it does not explain it with reference to gold measures. Surveys were made four years ago and the proofs have not reached the printer's hands yet.

Mr. Chas. Fergie—I understand the Hon. Mr. Sifton has taken the matter in hand and he is determined to push it through.

Mr. H. S. Poole—I would not complain of four years. A map may be a work of ten years or more.

Mr. Geo. Stuart—I think it would be well to ask Mr. Fletcher to reply to Dr. Ami's letter.

Mr. Chas. Fergie—I move that a copy of Dr. Ami's letter be sent to Mr. Fletcher for his comments for the further instruction of this Society.

Mr. Chas. Archibald—I second that motion.

GOVERNMENT ASSISTANCE TO DEEP MINING.

Mr. Geo. Stuart—Mr. President, It has occurred to me that a question which has frequently been before the Society in former years might be revived, namely, that of encouragement to deep mining in Nova Scotia. It occurred to me that we might perhaps to-day pass a resolution authorizing the Committee that has been appointed to meet the Government regarding the question of the Assay Office, and Technical Education, to impress on them also the advisability of offering some inducement for the sinking of a deep shaft—deep workings in our gold mines

Mr. Chas. Fergie—Would you not include coal too?

Mr. Geo. Stuart—If you think you require it?

Mr. Chas. Fergie—I think we do.

President Libbey—I think there is somewhat of a feeling among our Provincial officials that it is not of any use to do any deep gold mining in Nova Scotia. For instance, has it not been said that a diamond drill that would be used for gold mining need not go over 500 feet—that was deep enough. And does not Mr. Faribault in his papers convey an impression, probably, that it is better to scratch around near the grass roots?

Several Voices—No. To the contrary.

Mr. A. A. Hayward—I have heard that same suggestion thrown out.

Mr. F. H. Mason—So far as the legs of the saddles—but if you go down on the axis of the anti-clinal, he advocates deep sinking.

Mr. Geo. Stuart—And that you get recurrences of everything on the surface.

Mr. F. H. Mason—Yes.

Mr. A. A. Hayward—In what form would you suggest assistance?

Mr. Geo. Stuart—We have never been able to agree, and I do not think we will be ever able to agree, so that we could approach the Government to give any special inducement to sink a staft in any particular district. I think the inducement which they should offer would be applicable to any district, and it is this, that all gold over a certain term of years obtained below the 500 feet level, should be free of royalty—that to be the inducement.

Mr. Chas. Fergie—I am prepared to put a shaft down 2,000 feet to-morrow if the Government will give me free royalty on coal. I will start it to-morrow, if they will give me the royalty.

Mr. Geo. Stuart—But you would not have that apply to any of the present seams that are worked?

Mr. Chas Fergie—Why not?

Mr. Geo. Stuart—What would be the inducement to the Government?

Mr. Chas. Fergie—The inducement is to allow you to compete with other cheap seams—surface seams. Every hundred feet you go deeper you are increasing your cost, and you are going to reach a point in coal mining that you cannot possibly work. I am speaking now of vertical workings.

H. S. Poole—You mean with respect to a shaft that was made vertical and not after winnings had reached that depth by inclines in ordinary course of working.

Mr. Chas. Fergie—I am speaking of a vertical shaft.

Mr. Geo. Stuart—In the case of gold mining it would be different. I think it ought to apply to the depth of your workings which are on the slope of the lead.

Mr. Chas. Fergie—I do not think that the gold mines have any more to complain of than a coal mine. You have no market to compete with.

Mr. Geo. Stuart—So much the worse for us. In your case you know and in fact are absolutely sure that your seams do go down to a depth of 2,000 feet, and probably deeper, and that your coal will be just as good, and that you will obtain just as much at a greater depth as you do at your present depths.

Mr. Chas. Fergie—That does not follow.

Mr. Geo. Stuart—It follows that you are absolutely certain that your coal goes to great depths.

Mr. Chas. Fergie—It is not so.

Mr. Geo. Stuart—Our gold leads, it is thought, will not produce sufficient returns at greater depths to pay us to go down. That is the impression. And if the Government would offer an inducement I believe it would be an excellent thing. I would make all gold obtained below a level of 500 feet free of royalty.

The Secretary—Would they not be apt to meet you with this reply—what gold is taken out below that level?

Mr. Geo. Stuart—That brings up the question that we ought to impress upon the Government to appoint an Inspector such as they have not at present, to go to the mines and determine where the gold comes from. I would also like to follow up these remarks and criticize the annual report issued at the present time, and make comparison with the report of British Columbia as compared with the Nova Scotia Mines Report.

The Secretary—I think this same question of deep sinking was brought to the attention of the Government before, and they were perfectly willing to concede to the request if we could devise a ways and means and could agree.

Mr. Geo. Stuart—And I think too, that perhaps part of our failure at that time was partly due to the fact that the Commissioner of Mines took no interest in the matter. But now we have a man of a different character occupying that position. I am not speaking disparagingly of the late Commissioner at all. But we have a younger man now, a more progressive man, and I think he is ready to advocate any reasonable proposition that we place before the Government.

Mr. A. A. Hayward—Don't you think that the Government should have some incentive for doing this.

Mr. Geo. Stuart—I would say the removal of the royalty for a term of years would be the incentive. You might say five years, or if you like say ten years.

Mr. A. A. Hayward—Some 15 years ago, I had occasion to go over this same matter with a gentleman in this Province. We found it necessary to get data from Australia, and we found that there they were at one time in the same position as Nova Scotia is to-day. The Government of the various Provinces in Australia made arrangements to suit the exigencies of each case. In one of their Provinces they subsidized all mines 900 feet in depth ; and in other Provinces they prepared a scheme for the Commissioner to assist mines that were deserving without touching the question of royalty at all. I do not think there is anybody but is thoroughly convinced of the presence of minerals in our veins here, and the question is to interest capital and get the Government to do something. The Government must have an incentive, and that is the royalty.

Mr. R. H. Brown—How would it do to leave the royalty untouched and let them get the Government to assist. If it was for 500 feet that they would give them a proportion.

Mr. H. S. Poole—Said that he would like to see the Government committed to a certain policy—the details of that policy might be modified afterwards.

President Libbey—With such a resolution as this of Dr. Stuart I could go to work with clean hauds. They could not say I was asking anything for myself.

Mr. H S. Poole—If we can only agree among ourselves on the wording of a resolution we can get the Government committed to the policy.

Mr. Geo. Stuart—If there is any company to-day operating below 500 feet and their works are confined purely to development work, sinking, proving their lead, I think that although they may be considerably below 500 feet that they should not be debarred from reaping the benefits which this resolution would convey—because in mining parlance, you are not mining

until you are extracting ore, working ore for a profit. In sinking for development purposes it is another thing.

Mr. A. A. HAYWARD—It seems to me the object of the resolution is to induce people to prove the certainty of our mines; to prove what we believe. Now the question is if that is not incentive enough. To show that the ore does not "peter out" at 200 feet.

Mr. CHAS. FERGIE—If you have not got confidence how can you expect outsiders to have?

Mr. GEO. STUART—(To Mr. Hayward) when you speak of your mine "petering out" I take exception to that. There is no man in this room ever saw the bottom of a mine.

Mr. A. A. HAYWARD—You can see values reduced.

Mr. CHAS FERGIE—You can see the bottom of a mine when your capital is gone. (Laughter).

Mr. A. A. HAYWARD—I think the practice in Australia is a very good guide for us here.

Mr. GEO. STUART—I would be pleased to make this motion:

"This Society would ask the Government to consider the "desirability of remitting royalty on gold from ore stoped from a "depth greater than 500 feet vertical during the next five years, "and from mines now working below such a depth, where only for "development purposes."

I think this would be quite sufficient to begin with, as Mr. Poole has remarked, if we once get an inducement we could get them committed to that policy. I had a very satisfactory conversation with the present Commissioner of Works and Mines. He is quite favorable to offering us any reasonable inducement to deep sinking in Nova Scotia.

Mr. CHAS. FERGIE—I have discussed the same question with respect to coal with Premier Murray, and he has expressed the same opinion.

Mr. GEO. STUART—With respect to any proposition that we desire to make, it would not be necessary to wait until the House was in session. I think it would be well if it were made to the Commissioner in order that he would bring it up at the next meeting of the Executive.

Mr. F. H. MASON—I second the motion.

Mr. CHAS. FERGIE—I do not think it is going to interest capital. It is too small a matter.

F. H. MASON—If I were working a mine I would rather have the royalty off than be paid so much a foot as I go down.

A. A. HAYWARD—You want to reach the investing public. You want a subsidy of some kind to induce the people to invest their capital. One of the Australian Provinces gave a subsidy for every foot over 900 ft. level.

President LIBBEY—I am a good deal a theorist in politics. While there have been undoubted benefits arising from the paternal form of government, yet I do not believe in it. A man is always at his best when he is going ahead on his own resources, and nations are at their best when they are depending upon the individual resources of the people. Charity in any form is demoralizing. The recipient of charity simply lays back and basks in the sunshine, and holds his hands up for more charity. I am doing as much deep mining as anybody in Nova Scotia, and I have not asked for any aid. I would like to have the 25% taken off chrome stoel shoes and dies.

The resolution was then put and passed unanimously.

FIXED DATES FOR HALF YEARLY PAYMENTS OF RENTALS.

GEO. W. STUART—It was suggested to me by a mining man some time ago that it would be a good move by the Department of Mines to have half yearly dates of payment for all rentals—that is, if two fixed dates for the payment of rentals should be possible, say the 1st of January and 1st of July. It would simplify the work in the Mines Office very much, and they could send out all their notices on the same day. It would also save a great deal of bother to those who have a great number of rentals to pay, having to keep themselves posted daily. By having two dates of payment it would simplify matters very much. For instance, suppose you take up an area to-day, the rental on that area will begin from the beginning of the year. If you take it up after the beginning of the year the rental will begin half yearly. There will be two fixed dates at which the notices will be sent out, so that we would only have to pay rentals twice, instead of, as some of us have, of paying it almost every day.

A. A. HAYWARD—I think that is an excellent idea. That system was tried in the payment of dividends in assessments in Australia. All companies making assessment on a certain day, the assessment was due on a certain day a dividend was payable. I think it is a capital idea.

GEO. E. FRANKLYN said he concurred in the suggestion of having the rentals payable in January and July.

President LIBBEY—That would be very good, in one case. I held quite a numbea of leases, and to achieve that same result I surrendered the whole and took out a new lease, and in doing it I lost quite a number of dollars, but the advantage of having them come together was enough to offset the loss. I simply wanted to get them all on one date.

GEO. W. STUART—I surrendered 19 leases to get them to come due on one date. But I hold a great number of leases in which different people are interested, and these I could not surrender. But this particular block was held by two of us only and we agreed to surrender the whole and take them under one lease. Of course you have got to confine yourself to one district. I shou'd imagine that the Mines Department have got to keep a clerk going over the book the whole time, but if they only came due half yearly the work would be simplified very much indeed.

MINES REPORT.

GEO. W. STUART—I wish to say something about the very meagre, innacurate and badly compiled reports (The Annual Report of the Department of Mines) which the Government have been issuing for some years.

President LIBBEY—I happened to be in the Mines Office this morning, and I was asked why we did not say something about their reports. I was told they were waiting to hear from us.

GEO. W. STUART—The subject of an assay office, technical education, rebate on royalty in deep mining, and the advisability of issuing a better Mines Report, could be brought to the notice of the Government by one committee at the same time.

ALEX. MCNEIL—I believe the Government would publish a better Mines Report if we suggested how to do it.

GEO. W. STUART—There (pointing to the British Columbia Mines Report) is a capital suggestion in the way other Provinces prepare their reports.

President LIBBEY—We can imitate that system.

GEO. W. STUART—We have better material here for such a report.

H. S. POOLE—All we need to do is to point to the report of British Columbia and ask the Department to give us such a report.

President LIBBEY—I think nature has done as much for us as it has for British Columbia.

GEO. W. STUART—They could not issue a more meagre report than what they do. Those issued during the past few years do not begin to compare with the reports issued 25 years ago.

F. H. MASON—It is all made up in haste about the end of September, and we ought to approach the Government pretty soon about it.

GEO. W. STUART—The House wants to have this matter brought to its attention. I fancy there are not 10 per cent. of the members of the House that know anything about the character of the reports issued in the other Provinces.

H. S. POOLE—Would it not be well for the Mining Society to ask permission for a committee to go before the Mines and Minerals Committee of the House and the Executive on a certain day and produce for their information copies of the Mines Reports of the other Provinces, and furnish them with any other information necessary.

GEO. W. STUART—Yes.

GOVERNMENT ASSAY OFFICE.

ALEX. MCNEIL—There was a proposal made in Mr. Stuart's paper that we should urge the Government to provide a Government Assay Office, and it was mentioned at the time in reply to a question that the Premier had said last session that the Government had that under consideration and that he hoped he would be able to bring it about within a short time. We thought that if some definite move were made that we could induce the Government to provide for it at the coming session. It appears to me that now would be the time to move in that particular matter. I think the work could be done by the present committee. There are the four matters mentioned by Mr. Stuart upon which the committee could approach the Government.

GEO. W. STUART—I think Mr. McNeil is quite right.

The SECRETARY—One committee could attend to all four. Why not decide upon what points we desire to interview the Government on?

ALEX. MCNEIL—Is it not so that this Society has been endeavouring to do something about the Government Annual Mines Report for a number of years?

The PRESIDENT—Yes.

ALEX. MCNEIL—Has not the Government been approached several times about it?

The PRESIDENT—Yes. Dr. Gilpin only this morning said to me that "we are waiting for some suggestion from your Society," Dr. Gilpin is in the line of forcing us a little bit.

H. S. POOLE—They know about these reports of Ontario, British Columbia and Quebec.

ALEX. MCNEIL—The point I wanted to mention was this. I was asking whether this Society was not for years complaining about this annual report without any result, and it is now getting, you will admit, worse.

H. S. POOLE—Having pointed out to them what is done in other Provinces the Mining Society can do no more than suggest that an improvement is desired.

The PRESIDENT—Dr. Gilpin said to me this morning that they were waiting for our suggestions.

GEO. W. STUART—Who were waiting?

The PRESIDENT—The Mines Department.

The following resolution was then adopted:—

"That the two committees (W. L. Libbey, Geo. W. Stuart, A. A. Hayward, Alex. McNeil, H. S. Poole, F. H. Mason, S. H. Holmes, and Geoff. Morrow") be combined in one committee to interview the Government in relation to the following subjects:—

(1). A government assay office.
(2). Technical education.
(3). Encouragement to deep mining.
(4). An improved departmental report.
(5). To revive the legislation of 1885, requiring a record of plans of the workings of all metalliferous mines.
(6). That in future appointments to the position of deputy inspector shall be subject to passing a technical examination.
(7). That the present inaccurate maps and plans of the mines office be rectified.
(8). That all rentals be made payable on two fixed days in the year.

MINE'S OFFICE PLANS.

H. S. POOLE—With respect to the plans in the Mines Office I had occasion to take up the so-called mining plans issued by the Government for years to applicants, and to compare them with the admiralty charts and accurate surveys by private companies. I found on comparison that these maps did not agree—in fact there was an error in one case in a distance of not more than six miles of half a mile. A lake that should appear in the middle of an area according to the map of the mines department, was on the side line. It was therefore evident to anyone who compared the map with the natural objects that it was misleading—a stranger can not go on the ground with a Nova Scotia Mine's map and find out where his area is. I think this is a bad condition of affairs.

The PRESIDENT—I have had an exactly similar case to yours on my own property which was the original property taken up in the district—and the base line was established by presumably a competent surveyor. At any rate he was a surveyor. A year or two ago the Government sent another surveyor down. The two surveyors took the same original starting point. The Government surveyor, goes down and runs out this line here (indicating on the table) and this one here, and when he gets around to this corner he

is a rod away from the other fellow, and the result is we have two corner posts in there. I bought my surface rights on the original survey, and since then we have added a roadway to the public, and there are various improvements which make the surface rights worth something. Now the whole thing is a rod out. And another thing up here a little further, I found some property which I think is quite valuable and the vein on one survey runs exactly on the outcroppings of it—it runs exactly on the dividing line between the vacant areas over here and the other properties. Now I would like to know where we are at without going into court.

ALEX. MCNEIL—If you include the whole Province we will know where we stand.

H. S. POOLE—I always flattered myself that I took one step that was good when I got the Government of the day (1874) to put in iron or stone permanent corner posts to coal areas. That suggestion was acted on and there has been no litigation since. But there have been some areas overlooked and stone posts have not yet been put in.

ANNUAL MEETING.

GEO. W. STUART—I would also move that the Committees appointed this morning to meet the Government be empowered to arrange with the executive of this Society with respect to the date of the next annual meeting.

CHARLES STARR—I second the motion.

The motion passed unanimously.

PIT HORSES NEEDED.

Mr. POOLE called attention to a matter that should interest our horse-breeders and farmers. He said he desired to remind the society of the increasing demand for pit horses and the difficulty that increased as years roll on of procuring horses of suitable size and weight for use underground. Hitherto the provincial breeder had tended to produce either heavy animals for draft purposes or light-limbed stock for speed and action; and in these directions he had been encouraged by the general demand, by local agricultural societies and the prize lists at exhibitions. At the last meeting he Mr. Poole had brought up this matter and now suggested that the society express its views in a resolution that would call the attention of breeders of horses and others interested to this growing demand for a type of animal not hitherto receiving special consideration. In the past the average farmers' horse was undersized and hardly any difficulty was experienced in obtaining animals that suited in our coal pits. Now the tendency of the young farmer is towards the sulky and a trotter, to the progeny of pampered pedigree stock, very often to merely crossing the weeds left unsold and accentuating the weaknesses of both parents. His horse is now softer than of old and less able to withstand the hardships, wet, cold, poor feed and neglect that the native endured with comparative impunity. The tendency of the exhibition horse is to limbs of length, a characteristic of no convenience on the surface where barn doors can be made of any size and the vault of heaven has a roof high enough to be out of the way; not so in the majority of our pits where the coal roof and the timbers inserted for protection restrict the height. What is wanted, Mr. Poole thought, for the average coal pit is neither beauty of form nor speed, but a horse that is low set, has weight, and has a quick walk. To advertise the type of horse required, perhaps this society would consider the desirability of offering a prize at the forthcoming exhibition in 1902.

Mr. POOLE moved, seconded by Charles Fergie, that a prize be offered.

The motion on being put was passed unanimously.

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ANNUAL MEETINGS.

The ANNUAL GENERAL MEETINGS of the MEMBERS of THE CANADIAN MINING INSTITUTE, for the Transaction of Business, the Discussion of Papers, &c., will be held in the

CLUB ROOM, WINDSOR HOTEL, MONTREAL,
On Wednesday, Thursday and Friday, 5th, 6th and 7th March, 1902.

SINGLE FARE ON RAILWAYS.

Arrangements are being made whereby Members will be carried to Montreal and returned for a **Single Fare** on the Canadian Pacific, Grand Trunk, Intercolonial, Quebec Central, and Canada Atlantic Railways.

SPECIAL TOPICS FOR DISCUSSION.

In addition to a record programme of papers to be presented by the most eminent mining authorities in Canada, the following Topics have been slated by the Council for special discussion:—

GOVERNMENT AID TO MINING.
By Mr. JOHN E. HARDMAN, S.B., M.A.E., Montreal, Que.

COMPRESSED AIR.
By Mr. W. L. SANDERS, New York, N.Y.

COLLIERY VENTILATION.
By Mr. CHARLES FERGIE, M.E., Westville, N.S.

POWER DRILLS.
By Mr. C. C. HANSEN, Montreal, Que.

HAULAGE.
By Mr. WM. BLAKEMORE, M E., Montreal, Que.

PUMPING.
By Mr. JOHN P. NORTHEY, Toronto, Ont.

Syllabus of papers and detailed programme of arrangements will be sent to members in due course.

CHARLES FERGIE, *President.* B. T. A. BELL, *Secretary.*

FOR SALE.

Valuable Mining Property

AT NORTH BEND, B. C.

TENDERS will be received by the OTTAWA HYDRAULIC MINING AND MILLING COMPANY, LIMITED LIABILITY, addressed to the undersigned, up to Monday the 6th day of January, 1902, for the purchase of their mining property and water rights at North Bend in British Columbia and which may be known as that piece of ground situate at Boston Bar on the east side of the Fraser River and formerly known as mining ground leased to John Webb, containing sixty-four acres, more or less, and the grant of water right to use five hundred inches of water out of Four Mile Creek, opposite Lyons Ranch, near North Bend, together with a flume about four miles long, extending from Four Mile Creek to the mines of the Company.

There is situate upon the mining land a portable sawmill, two monitors, a large quantity of iron piping, and also mining tools and supplies which will be sold with the mine property.

The Vendors are not to be bound to accept the highest or any tender.

For particulars apply to WILLIAM C. MCGILLIVRAY, New Westminster, B.C., or to the undersigned.

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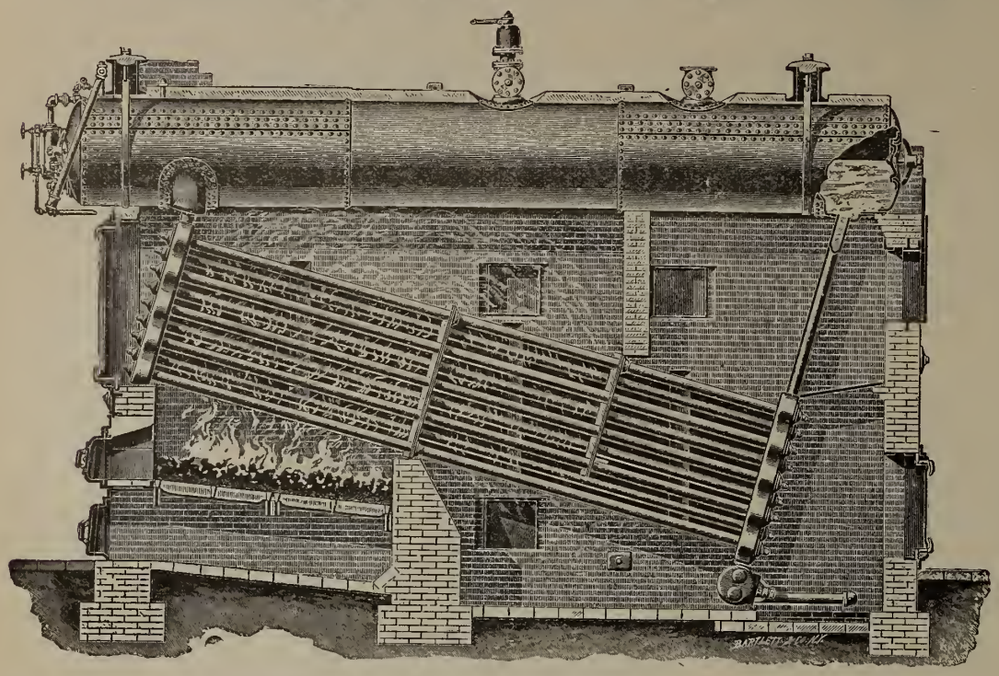

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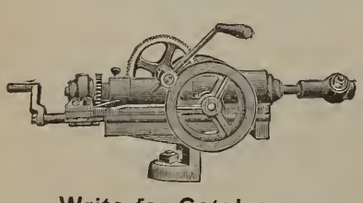

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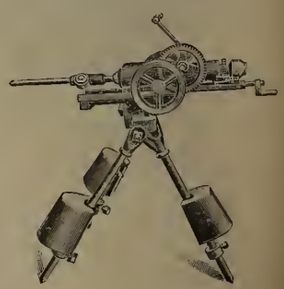

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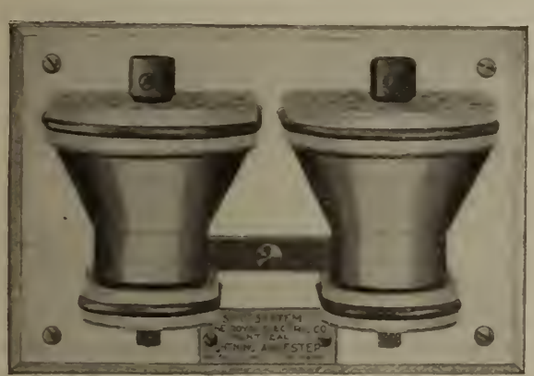

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The most complete and handily arranged work of reference to Canadian mining undertakings extant.

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THE CANADIAN MINING REVIEW

OTTAWA, CANADA.

DOMINION OF CANADA

SYNOPSIS OF REGULATIONS

For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

COAL.

Coal lands may be purchased at $10.00 per acre for soft coal, and $20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order in Council shall be collected on the gross output.

QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's Certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of $10.00 per annum for an individual, and from $50.00 to $100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end on the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is $5.00.

At least $100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When $500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at $1.00 an acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee $5.00 renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental $10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds $10,000.00.

DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed in the river below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, $100.00 per mile for first year, and $10.00 per mile for each subsequent year. Royalty ten per cent. on the output in excess of $15,000.00.

PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River and Hill Claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer Claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim, and each person in his or its employment, except house servants, must hold a Free Miner's Certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee $15.00. Royalty at the rate of five per cent charged on the gross output of the claim, with the exception of an annual exemption of $5,000 00.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek or gulch, but the same miner may hold any number of claims by purchase, and Free Miners, not exceeding ten in number, may work their claims in partnership, by filing notice and paying fee of $2.00. A claim may be abandoned and another obtained on the same creek, gulch or river, by giving notice and paying a fee.

Work must be done on a claim each year to the value of at least $200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of $200.00 and after that $400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette.*

HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of $150.00 for each mile of frontage, and a royalty of five per cent. on the gross output, less an annual exemption of $25,000.00 are charged. Operations must be commenced within one year from the date of the lease, and not less than $5,000 must be expended annually. The lease excludes all base metals, quartz and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery at the rate of $1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

JAMES A. SMART,
Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.

Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

HONORABLE E. J. DAVIS,
Commissioner of Crown Lands,

or

THOS. W. GIBSON,
Director Bureau of Mines,
Toronto, Ontario.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents anuually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted Gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquired promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,
Commissioner Public Works and Mines,
HALIFAX, NOVA SCOTIA.

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The attention of Miners and Capitalists in the United States and in Europe is invited to the

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Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are $5 and $10 per acre for mining lands containing the superior metals*; the first named price being for lands situated more than 12 miles aud the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, $2 and $4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mlning of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than $500 if mining for the superior metals; and not less than $200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, $2 for every 100 acres or fraction of 100; if the mine is on Crown lands (1) in unsurveyed territory, $5 for every 100 acres, and (2) in unsurveyed territory, $5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of $5 and an annual rental of $1 per acre. Each license is granted for 200 acres or less but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
PARLIAMENT BUILDINGS, QUEBEC, P. Q.

SCHOOL OF MINING,

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1—Three Years' Course for a Diploma in

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(B) Analytical Chemistry and Assaying.

2—Four Years' Course for a Degree B.Sc. in

(A) Mining Engineering.
(B) Chemistry and Mineralogy.
(C) Mineralogy and Geology.

3—Courses in Chemistry, Assaying, Mineralogy,

and Geology for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)
For further information see the Calendar of Queen's University.

4—Post-Graduate Course for the Degree of

Doctor of Science (D.Sc.)
For further information see the calendar of Queen's University.

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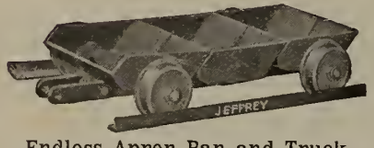

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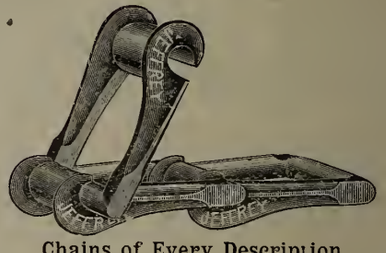

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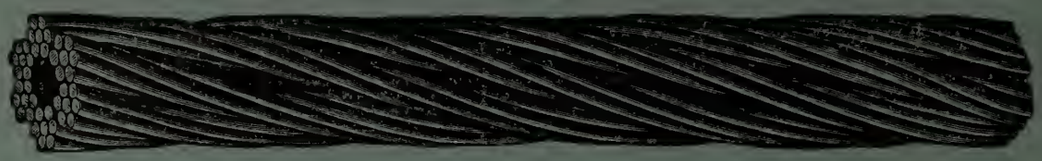
THE DOMINION WIRE ROPE CO. LIMITED

MONTREAL, CAN.

Manufacturers of **"LANG'S" PATENT WIRE ROPES**



FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.

ALSO

SOMETHING NEW...

SOMETHING TO LAST...

The Wearing Surface of Hemp. The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C. Rossland, B.C. Winnipeg, Man. Toronto, Ont. Ottawa, Ont. Halifax, N.S.

CATALOGUE ON APPLICATION.

MINING AND CONTRACTORS' RAILS...

RELAYING RAILS 45 lbs., 56 lbs., 65 lbs. per Yard.

IMMEDIATE SHIPMENT.

LIGHT MINING RAILS

12 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

ORE AND ..Mining Cars..

WHEELBARROWS ALL KINDS

SPECIAL ORE BARROWS

Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

CATALOGUE ON APPLICATION

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